

THE
MANCHESTER SCHOOL
OF
ECONOMIC AND SOCIAL
STUDIES

VOLUME XXIII

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Vaduz

1964

THE
MANCHESTER SCHOOL
OF
ECONOMIC AND SOCIAL
STUDIES

1955

Printed in Germany

Lessing-Druckerei — Wiesbaden

CONTENTS

No. 1. January, 1955.

	<i>Page</i>
SOME RESULTS OF DISTRIBUTION OF INDUSTRY POLICY	JOSEPH SYKES 1
THE MONOPOLIES COMMISSION AND ECONOMIC WELFARE	ALEX HUNTER 22
THE PROSPECTS OF BRITISH SHIP- BUILDING	LESLIE JONES 41
NORMATIVE FACTORS IN THE SUPPLY OF LABOUR	HILDE BEHREND 62
LAND-USE, LOCATION AND TRANSPORT	KATE LIEPMANN 77



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THE MANCHESTER SCHOOL OF ECONOMIC AND SOCIAL STUDIES

CONTENTS	<i>Page</i>
ECONOMIC EXPANSION AND INTERNATIONAL TRADE	H. G. JOHNSON 95
SECULAR SWINGS IN PRODUCTION AND TRADE, 1870-1913	W. A. LEWIS P. J. O'LEARY 113
THE DEVELOPMENT OF AGRICULTURAL PRO- DUCTION IN GREAT BRITAIN AND IRELAND FROM THE EARLY NINETEENTH CENTURY...	LEO DRESCHER 153
DRESCHER'S INDEX : A COMMENT	T. W. FLETCHER 176
THE IMPACT OF COMMERCIAL GROWTH ON AGRICULTURAL TENURE SYSTEMS IN INDIA	A. GHOSH 184
BOOKS RECEIVED 191

PUBLISHED THREE TIMES A YEAR

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KRAUS REPRINT LTD.
Nendeln, Liechtenstein
1967

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CONTENTS

No. 3. September, 1955.

Page

ECONOMETRIC MODELS AND THE AVERAGE DURATION OF BUSINESS CYCLES	J. JOHNSTON	193
NATIONAL INSURANCE CONTRIBU- TIONS, 1946-1955	D. WALKER	228
OWNER FARMING IN ENGLAND AND WALES, 1900 TO 1950	S. G. STURMEY	245
SOME ASPECTS OF URBAN DEVELOP- MENT BY COLLIERY COMPANIES, 1919-1939	P. H. WHITE	269
AGRICULTURAL DEVELOPMENT IN ISRAEL	E. J. M. MAYER	281

Some Results of Distribution of Industry Policy

This article deals with some of the results during 1945-53 of the policy followed in giving effect to the Distribution of Industry Act, 1945, and the subsequent Housing and Town Planning Act, 1947 and the Distribution of Industry Act, 1950.

I

As the fundamental aim of the policy was "... to provide for the development of certain areas ..." ¹ these, designated as Development Areas, may be dealt with first.

Between mid-1945 and the end of 1953, some 2,000 new factories, or extensions of old factories, occupying about 62m. square feet, were completed in the Development Areas.² At the end of 1953, some 270 more, occupying about 14 m. square feet, were under construction. Judged by area, these figures represented about 35 per cent. and 26 per cent., respectively, of the comparable totals for Great Britain.

It would be wrong to suppose that this somewhat substantial volume of new factory building in the Development Areas was solely the outcome of distribution of industry policy. Much of it would have taken place if there had been no such policy. For the post-1945 shortage of labour was much less in the Development Areas than in the rest of the country. Partly this was because throughout 1945-53 they had nearly twice the percentage of unemployment recorded by the rest of the country, and partly because their reserves of labour—especially women and girls—were proportionately much larger.³ The smaller shortage of labour in the Development Areas, of itself, would have induced firms from other parts of the country to

¹Part of the title of the Distribution of Industry Act, 1945.

²The first Development Areas were Scottish, Northern, West Cumberland, South Lancashire, Wrexham and South Wales. In 1949, Merseyside and North Scotland were added, and in 1953 North East Lancashire.

³At mid-1946, the Development Areas had some 200,000 insured persons unemployed. At mid-1948, the ratio of women to 100 insured men was 50.3 in Great Britain, but only 42.0 in the Development Areas. If the ratio for the Development Areas could have been raised to that for Great Britain, about 190,000 more women would have been insured.

build there. And they would have been able to do so because of the large supplies of constructional labour brought into being by the substantial amount of factory building undertaken in the Development Areas during the war. Another weighty reason was the shortage of housing. This was general, but was more severe in areas where the demand for labour was high. And since national housing policy failed to give the areas of greater labour shortage sufficient extra houses to meet their greater needs, while local housing policies favoured local persons rather than immigrants, substantial migration of the surplus labour of the Development Areas to labour-shortage areas was not feasible. But firms could—and did—tap that surplus labour by voluntarily erecting factories in the Development Areas. A last reason is that, if there had been no distribution of industry policy, both firms already established in the Development Areas in 1945, and other firms starting new ventures then and later, would have built new factory premises there in so far as the locations were judged to be appropriate.

Nevertheless, a part of the post-1945 factory building in the Development Areas can properly be attributed to distribution of industry policy. For the government offered inducements to firms willing to build there, and applied deterrents to firms desiring to build elsewhere. The inducements had the greater significance. During the first two-and-a-half years, firms could obtain building licences—and sometimes scarce materials—more readily if they built in the Areas. Even though after 1947 firms that produced foreign-trade goods, and from early 1951 onwards firms that made goods needed for the defence programme were often allowed to build elsewhere, firms that made other kinds of goods could obtain licences more freely if they went to the Areas. Throughout the period, besides, firms could become tenants of factories erected in the Areas by the government, and enjoy rentals somewhat below market rates. Evidently this inducement was attractive; for about two-fifths of the total factory space created in the Areas during 1945-53 was financed by government. Furthermore, loans for operating capital were available, on certain conditions, to firms choosing locations in the Areas; and up to the end of 1953 a number had been sanctioned. Lesser inducements included the offer of

surplus war factories ; special allocations of houses for managers and keyworkers ; training of workpeople ; some assistance in tendering for government contracts ; and help in overcoming obstacles impeding production.

The major deterrent was the restriction upon factory building in congested areas such as Greater London and Greater Birmingham. After the first two-and-a-half years the ban was often lifted—but only in the case of firms making foreign-trade goods or products needed for the defence programme, and firms having quite exceptional claims. A minor deterrent was the reluctance of the government to assign surplus war factories in the rest of the country to private firms. Clearly, these inducements and deterrents must have contributed to the factory space created in the Areas during the period.

What has been the outcome of that factory building viewed from the standpoint of the Areas? The effect upon unemployment may be considered first since it was a cardinal aim to reduce it. During the period, unemployment averaged only some 4 per cent. The major explanation seems to be the high national level of employment. Some support for this view is given by the similar variations of unemployment in the country as a whole and in the Areas—the coefficient of correlation is + .81. Besides, the high national employment was accompanied by pronounced activity in basic industries—coal, iron and steel, heavy engineering, heavy chemicals, and shipbuilding—which were more strongly represented in the Areas than in the country as a whole. Again, the Areas benefited from the growth in export because these basic industries contributed much, both directly and indirectly, to export.

But the factory building in the Areas was a cause of their low post-1945 unemployment. For the new and extended factories had come to employ about 150,000 persons¹ by the end of 1953—some 12 per cent. of the Areas' total numbers in manufacture then ; and partly these came into existence because of distribution of industry policy. In addition, the

¹No account is taken of nearly 100,000 persons who had come to be employed by private firms in the Areas' surplus war factories by the end of 1953. Such employment might have been smaller but for the great activity shown by the Board of Trade in persuading firms to go—mainly from elsewhere—to these.

factory building itself gave rise to employment. And both these kinds of direct employment generated indirect employment.

Another outcome is upon the industrial efficiency of the Areas. Since, even yet, their insured numbers in the above-named basic industries are proportionately about one-and-a-half times those for the country generally, it is important to ask how distribution of industry policy affected them. The following table contains material bearing upon this.

DEVELOPMENT AREAS ¹					
PERCENTAGE OF THE TOTAL ESTIMATED EMPLOYMENT IN NEW FACTORY BUILDINGS IN THE INDUSTRIES NAMED					
Non-metalliferous mining products	...	...	...	...	2.6
Metal manufacture	...	...	...	...	6.5
Metal goods ²	...	...	...	...	4.2
Chemicals and allied trades	...	...	...	...	9.3
Vehicles ³	...	...	...	...	7.7
Shipbuilding, engineering and electrical machinery ⁴	...	...	...	...	20.4
					<hr/> 50.7 <hr/>

The above industrial groups are somewhat wider than the basic industry groups existing in the Areas before distribution of industry policy was started and the true proportion of new factories in the old basic industries was rather less than 50 per cent. Yet this is a high figure. How far distribution of industry policy influenced it cannot, unfortunately, be assessed. A number of the projects would have materialised if there had been no such policy. For some were to replace old capacity; others were extensions of existing plants; others again represented spontaneous moves to the Areas by firms from elsewhere that were attracted by the availability of labour. Yet distribution of industry policy certainly played a part. For the departments strongly encouraged new projects in the old basic industries. Moreover, they succeeded in piloting to the Areas schemes that would otherwise have been carried out elsewhere—by means of the powerful inducements named

¹All except North Scotland; the period is 1945-53.

²Those metal goods not named in the last item of the table—chiefly iron and steel forgings; wire; brass; hollow-ware; bolts, nuts, rivets, screws, tools.

³Mainly locomotives, railway wagons and carriages, motor vehicles and aircraft.

⁴Electrical goods other than electrical machinery are excluded.

earlier, and by helping immigrant firms to obtain sites, trained labour, essential services, special housing facilities for managers and keyworkers and, above all, by allocating surplus war factories to them.

Two results of these factory projects call for notice. One is that they helped the basic industries of the Areas to develop new products, and the other is that they led to improvements in technique. New products included gas turbines, earth-moving equipment, new kinds of mining machinery, new chemical products such as synthetic fibres and detergents, and plastics. Instances of better techniques are improvements in the lay-out, equipment and methods in shipyards, in heavy electrical engineering, coalmining plants, blast furnaces foundries and coke ovens, the large-scale making of tinplate, and the continuous casting of steel bars. These twofold developments in the old basic industries of the Areas raised their efficiency. Since, even at the end of the period, the Areas depended upon these industries for over two-thirds of their total employment in mining and manufacture, the gains resulting from the higher efficiency—notably greater competitive power, increased employment¹ and higher incomes—were correspondingly large. And, as said above, partly these gains were due to distribution of industry policy.

That policy also helped to foster industrial efficiency in the Areas by assisting the establishment of new industries. These inevitably attracted labour away from the old industries. In doing so, however, they may have caused the latter to improve the deployment of their labour forces, thereby promoting efficiency in using labour. Besides, the new industries trained labour in new techniques. They brought with them not only modern capital equipment but also new methods of production and fresh industrial ideas²—some of which may have spread to the old industrial firms. Last, the new industries provided growing points—an element in industrial efficiency rare between the wars.

¹Between 1948 and 1953, insured numbers in the industry groups named in the table on p. 4 increased by 3·2 per cent. Part of this increase may have been brought about by expanded output due to higher efficiency.

²An impressive number of the factories that were entirely new was opened by national firms which had a reputation for efficiency.

To summarise : distribution of industry policy and action benefited the Areas by helping to lessen post-war unemployment, expand employment, raise incomes, and improve their industrial efficiency.

The advantages are, however, by no means unqualified. The Areas' new industry may not easily withstand economic depression because its costs of production may be higher than in the rest of the country. Yet, as the table on p. 4 shows, nearly one-half of the estimated employment in the new industry was in types of industry previously well-established in the Areas. Therefore firms in these are unlikely to suffer significant cost disadvantages. About another one-fifth is in industries that have a low, or moderate coefficient of localisation.¹ Differences of costs in these arising out of location in the Areas may, therefore, not be damaging. The remaining fraction of the new industry may, indeed, have higher costs than elsewhere.

Further, while only about one-half of the aggregate new factory space in the Areas was in entirely new factories, some four-fifths of the new firms are branches of firms domiciled elsewhere. Economic depression might cause the branches to be closed. That is possible, but is not likely when, *e.g.*, the output of the branch is an essential part of that of the parent ; or the product of the branch is entirely different and costs are not unfavourable ; or when the costs of production are not significantly higher than at the parent factory ; or when the products made by both branch and parent are not markedly subject to contraction of demand in depression. For these reasons, a general closing of branches is not to be expected.²

¹Examples are—dress goods and clothing ; food and drink ; printing, paper and stationery ; wood, fibre-board, cork and cardboard products ; railway wagons and carriages ; furniture, upholstery and soft furnishings ; electrical machinery ; radio, wireless valves and batteries ; paints ; glass ; plastic goods ; light chemicals ; household appliances such as vacuum cleaners, electric and gas cookers ; light electrical goods such as fractional motors ; scientific instruments ; photographic goods ; toys and sports goods ; parts and accessories for aircraft and motor vehicles ; leather and rubber goods.

²See also Luttrell, *The Costs of Industrial Movement*, pp. 74, 75, 82 ; Picton, "Notes on the Establishment of Branch Factories," *The Journal of Industrial Economics*, April, 1953, pp. 126-131 ; and Hague and Newman, *Costs in Alternative Locations in the Clothing Industry*, pp. 53, 54.

Still further, at the end of 1953, the sum of the employment provided by the new industry was only about 12 per cent. of that afforded by all the old and new manufacturing industry combined. Yet the usefulness of the new industry in combating future unemployment may be greater than this figure suggests. For, judged by employment, about two-fifths of the new industries are of types that are less sensitive to cyclical depression¹—i.e. non-durable consumption goods and mainly home-market goods industries. Moreover, some are expansionary, and may therefore be quick to escape from cyclical depression.² As for structural unemployment, since rather more than one-half of the estimated employment in the new factory building is different in type from that in the old industries, such structural unemployment might in consequence be mitigated. As for persistent general unemployment, the new factory industries may lend themselves more readily to national anti-unemployment measures. Such measures would be difficult to apply to the old industries predominantly engaged in export; for it would not be easy to create a home demand to match the lost foreign demand. The industries new to the Areas are not so deeply committed to foreign markets. Finally, unemployment in the Areas might result if their old basic industries were to contract. This is not unlikely. Coalmining may do—and two-fifths of the country's labour force in this is in the Areas. Shipbuilding may trend downwards; and two-thirds of the country's labour force is in the Areas. Tinplate has already shed labour, and will shed more when the new plants are finished. The great bulk is in the South Wales Development Area. Lower-grade textile output and employment may fall as time passes. Only chemicals and certain kinds of engineering promise to employ more—but probably not enough to absorb

¹e.g. both light chemicals and certain industrial chemicals; rayon and nylon yarns; anti-biotics; paints; detergents; printing, paper and stationery; wood and cardboard box; fibre-board; food and drink; cotton, wool and jute textiles; tailoring, dress goods, overalls, shirts and underwear; knitted goods; certain rubber goods; boot and shoe; sports goods.

²e.g. diesel engines; gas turbines; aeroplane components and engines; scientific instruments; television, radar and electronic goods; plastics; asbestos products; synthetic fibres; chemicals; chemical rubber; solvents; vacuum engineering; agricultural implements; electrical engineering goods.

the whole of the labour discharged by the contracting industries. But, over a period, the new industries have prospects of expansion.

Another qualification is that parts of the Areas have received less new industry than other parts, so that their dependence on specialised industry has not been assuaged much *e.g.* districts in South-East Northumberland, North-West and South-East Durham, West Renfrewshire, Upper Clydeside.

A last qualification is that an abnormal fraction (about 55 per cent.) of the total employment afforded by the new factory building is for females. Therefore, the dependence of males upon the old basic industries for work has been reduced less than if the new factories had absorbed more males.

II

In the later years of the period, distribution of industry policy was increasingly concerned with the rest of the country. Of the national total of new factory space completed by the end of 1953, some 65 per cent. was located there. For schemes not completed, the figure was some 74 per cent.; and for schemes approved but not started it was about 83 per cent. These figures may be compared with the roughly 82 per cent. of the national total of insured population in the rest of the country then.

What were the main factors influencing new industrial building in the rest of the country? One was that, when locations in the Development Areas would be highly disadvantageous, the Board of Trade often approved locations elsewhere. The Board also sometimes approved locations elsewhere for firms making significant contributions to output. Some industry was steered to places having plentiful reserves of labour or high and sustained unemployment. In and after 1947, firms making foreign-trade goods were often allowed to choose their own locations. In and after late 1950, that was also true of firms making goods for the defence programme. Last, some new factory building was approved for new towns and other towns able to accommodate firms moving out of congested areas.

What has been the outcome of this distribution of industry policy for the rest of the country? The following table bears on this.

REST OF THE COUNTRY OUTSIDE THE DEVELOPMENT AREAS

Region	Percentage of Insured Numbers in Manufacture in 1948	Percentage of Factory Building Approved during 1945-52	Col. 3 as percentage of Col. 2
London & South Eastern	26.3	15.5	59
East & West Ridings	12.7	11.2	88
Scotland	4.0	3.8	95
North Western	16.4	16.8	102
North Midlands	8.8	9.3	106
Midlands	16.3	18.8	115
Northern	0.6	0.7	116
Southern	4.2	4.9	117
South Western	4.9	6.4	130
Eastern	5.1	10.7	210
Wales	0.7	1.9	270
Total	100.0	100.0	100

The last column of the table suggests that approvals to build varied somewhat widely from one region (or part) to another. But it shows that while the shares of London and South Eastern, East and West Ridings and Scotland (part) were less than their shares of the national labour force in manufacturing, those of the other eight regions (or parts) were greater. In other words, although firms found it difficult to obtain approval to build in three regions, they found it relatively easy to secure approval in the other eight regions. The last column also shows that it was far more difficult to obtain consent to build in London and South Eastern region than any other. The inference is that firms already established outside this region were fairly free to extend or build new premises there. This inference is supported by an examination of Industrial Development Certificates granted by the Board of Trade in and after 1948. The majority of these were for extensions to, or rebuilding of, existing factories. Such freedom to continue in preferred locations, or to choose new ones in widely different parts of the country, suggests that firms could operate where their private costs were low.

Another discernible outcome is that distribution of industry policy helped to adjust demands for labour and other productive resources to the supplies available in different areas. The simplest illustration is the piloting of factory projects to seaside resorts that experienced seasonal unemployment—*e.g.* Fleetwood, Blackpool, Morecambe, Weston-super-Mare, Weymouth, Brighton, Folkestone, Dover, Margate, Southend-on-Sea and Great Yarmouth. The total factory space steered to these was, however, not substantial. Another is the placing of new industry in places that had high and continued unemployment—*e.g.* West Cornwall, Plymouth, the Medway towns, Grimsby, Hull, Leven, Kirkcaldy and the Furness area. But again the total was moderate only. Some new projects were diverted to places having unused reserves of labour—especially coalmining places. Thus, in the South Yorkshire coalfield, some factory building occurred at South Kirkby, South Elmsall, Barnsley, Royton, Worsboro Dale, Wombwell, Maltby and Thorne. Other examples include Scunthorpe, Worksop, Cannock, Ulverston, Flint, Blaenau Festiniog, Cinderford and Pembroke. Where local industry was growing faster than local labour supplies, the Board of Trade tried to steer new factory schemes to places where labour was more plentiful. Thus, new projects in hosiery, knitwear and lace were diverted from Nottingham and Leicester; in metal goods and engineering from the Birmingham area; in aircraft from Hatfield and Kingston-on-Thames; in wool and worsted from Bradford and Leeds districts; in clothing from Manchester and Leeds; and in many industries from London and around. More usually, the new projects were distributed not far away—*e.g.* those named above that were diverted from Nottingham, Leicester and surrounding places were placed in Oakham, Melton Mowbray, Alford, Syston, Clay Cross, Ilkeston, Staveley, Sutton-in-Ashfield and Scunthorpe; from the Birmingham area in Wellington, Iron Bridge, Coalbrookdale, Bromsgrove, Kidsgrove, Lichfield and Cannock. Sometimes, however, the new venue was many miles distant. The alternative method of attracting immigrant labour to the labour-shortage places was limited by a housing policy which spread new housing widely over the country. But sometimes special allocations of houses

were secured—*e.g.* at Northwich, Ellesmere Port, North Staffordshire, and Corby.

Another outcome resulted from the policy of restricting industry in congested areas—mainly Greater London and Greater Birmingham. This caused firms there to set up branches elsewhere—*e.g.* of some 500 firms new to the Development Areas many represented branches of firms elsewhere and, particularly, firms in congested areas. Sometimes firms moved in their entirety.

A less tangible outcome was the assistance given to expanding places to go ahead. This occurred when the Board of Trade allowed new factory building by firms making foreign-trade goods and products needed for the defence programme in locations named by them. For such types of output recorded spectacular increases and the places concerned expanded. It also occurred when firms contributing substantially to productivity were able to develop in locations they preferred—places which, in consequence, expanded. Lastly, it occurred when, for other reasons, growing firms were able to choose the sites for their new developments.

Last, a moderate amount of new factory space was approved in new towns and towns neighbouring congested areas.

III

Three main effects of distribution of industry policy upon the economy as a whole may now be considered—upon aggregate industrial output, the balance of payments and unemployment.

During the period, the principal restraint upon the growth of industrial output was the general shortage of labour, and especially the acute shortage in those areas capable of achieving large increases of output. Since the Development Areas had both spare, unemployed labour and proportionately greater reserves of labour than the country generally, industrial production could be increased by diverting new factory projects to them. That was true also of the other areas named earlier that had spare labour. The firms so diverted were drawn principally from Greater London, the Birmingham conurbation, Leicester, Nottingham, Manchester, Leeds, Sheffield, Bradford, Huddersfield, Halifax, Derby, Northampton, Slough, Reading,

Watford, Luton, Bristol and Rugby. Outstandingly so in the cases of Greater London and the Birmingham conurbation, these were places where the demand for labour ordinarily exceeded the local supplies. Industrial output was increased not only by steering new factory projects to the areas having spare labour but also by avoiding the worsening of labour turnover, restrictive practices intensified by a sellers' market for labour, long-distance travel to work, and pressure upon sorely-strained utility services in the areas of labour shortage.

Another important restraint was the insufficiency of housing. Although there were exceptions, the insufficiency was greater in places whose industries were expanding rapidly. But, as shown before, both national and local housing policies failed to increase the supply of housing in these places by enough to meet their needs for additional workpeople. Nor did the various special schemes—*e.g.* for export industries and for firms nominated by production departments—produce many dwellings. Therefore, the best and also the speediest way of promoting more industrial production was to build new factories, or extend old ones, where supplies of labour could be drawn upon that was already housed. Pre-eminently, those parts of the country were the Development Areas and, to a lesser degree, the other areas having surplus labour.

Besides in these ways, distribution of industry policy fostered industrial output by making surplus war factories available for private firms to occupy. This was especially useful during the first two-and-a-half years of the period because few new factories were completed then. Because the Areas had a proportionately greater share of war factories than the country generally—nearly one-quarter against their one-sixth share of insured workpeople—it was advantageous to pilot new enterprises to the Areas. In the three ways named, then, distribution of industry policy caused industrial production to be greater than if there had been no such policy.

This finding could be questioned. For instance, did not the new industry in the Areas reduce the labour supply of their old basic industries and thereby curtail not only their output but also that of later-stage industries dependent upon them for supplies? That the new industry did draw away labour

from these basic industries is unquestionable. But the drain was not severe. For although unemployment in the Areas fell, it remained throughout the period nearly twice the national percentage. Nor was that unemployed labour not usable by the basic industries; for even though a higher ratio of it was disabled than in the country generally, its average age was less.¹ Besides, it may be recalled that nearly one-half of the estimated labour force in all factory projects in the Areas was in their basic industries. And the other half was in industries which were large users of female labour²—little in demand by the basic industries. Finally, the Areas' basic industries of coal-mining, iron and steel and other metal manufacturing, engineering, shipbuilding, vehicles, other metal goods, chemicals and tinplate actually increased their labour force from 1,116,000 in 1948 to 1,152,000 in 1953.³ This rise of 3·2 per cent. was larger than that of 2·8 per cent. in the Areas' total insured numbers. As for the other areas that had spare labour, they were but moderately engaged in those basic industries that suffered shortages of labour.

But in the country generally certain major industries reported deficiencies of labour during the period—*e.g.* coal-mining, some metal-making and metal-using industries, chemicals, textiles, jute and pottery. Those deficiencies could have been relieved if the spare labour of the Areas and other districts had migrated; but did not distribution of industry policy prevent it? In fact, migration from the Areas was proportionately greater than from other regions. Presumably it would have been larger if more houses had been provided in the districts having labour shortage. But if the migration of males had been much larger, possibly the Areas' basic industries could not have increased their labour force as they did—and these were among those in which the country generally was short

¹At December, 1953, 15·4 per cent. of the unemployed persons in the Areas were disabled against 14·5 per cent. in Great Britain; but only 46·1 per cent. of them were over 40, against 51·7 per cent. in Great Britain.

²Between 1948-53, the number of insured females in the Areas rose by about 140,000. An unknown, but possibly not unsubstantial proportion found work in the new industries.

³The ending of the war caused numbers in these industries to fall during 1945-47 in both the Areas and the country as a whole.

of labour. It is worth mention, in addition, that the Board of Trade either banned entirely or restricted new factory projects in areas where textiles, jute, pottery, metal manufacture and the making of vehicles were important.

To proceed, did not distribution of industry policy check the progress of expansionary firms—partly by preventing such firms from building *in situ* or nearby, and partly by denying them the building resources taken for projects in the Areas? It will be recalled that firms making foreign-trade goods and defence products, and firms achieving distinctive gains in productivity, were usually able to expand *in situ* or elsewhere if they wished. The table on p. 9 showed also that firms developing in the rest of the country had a fairly free choice of location outside the London area. And some three-fifths of the total factory space completed by the end of 1953 was outside the Areas. It would seem that expansionary firms—mainly those making the above-mentioned products—were not seriously checked. And this view is supported by the fact that a minority, only, of applications for Industrial Development Certificates were refused. The refusals were highest in the congested areas, and undoubtedly expansionary firms in these suffered. But this was not unequivocally inimical to the rise of industrial output. For further congestion would have impeded this by increasing labour turnover, transport delays, travel to work, and—above all—by restricting the freedom of firms to manoeuvre. Nor was the supply of building resources seriously curtailed to expanding firms; for, as said above, these in general received preference in the award of Industrial Development Certificates and building licences. Indeed the vast housing programme and the limitations upon private capital investment were the main reasons why growing firms met with difficulties in procuring building resources.

Lastly, did not the diversion of new industrial projects to the Development Areas check the growth of industrial output because costs were higher there than they might have been elsewhere—so that a given input yielded a smaller output? This matter has been examined briefly on p. 6, and it was shown that firms encountering higher costs in the Areas were a minority of the whole that undertook factory building. As

time passed, these minority firms may have overcome some of the cost disadvantages they met with at first. For the supply of trained managerial staffs, supervisors, technicians, and skilled labour would improve. In the branch factories—over four-fifths of all new factories—as Luttrell, Hague and Newman, and Picton have instanced,¹ earlier difficulties that parents had in coping with branches tended to lessen later. That would increase the outputs from given inputs. Possibly, besides, certain external economies have now been developed—such as improved essential services, ancillary firms, and economies in marketing. Perhaps the most significant consideration is that, by going to the Areas, firms avoided higher labour costs in places where labour was in short supply.

Possibly these negative considerations do not overturn the view that during the period distribution of industry policy promoted increased total industrial output. The dominant positive consideration seems to be that it added to the country's employed labour force—perhaps a quarter-of-a-million persons²—and so to industrial production. Lesser positive considerations are that it rarely impeded expansionary firms in the rest of the country outside the Areas, and reduced the losses to industrial production which further congestion of industry and people would have inflicted.

This view might not be tenable in the more immediate future. Thus, the firms now in inferior locations in the Areas might close and go to better ones elsewhere. If they could take their labour with them, however, their output might not suffer. If that labour stayed behind, its product might be lost. The likely outcome is that some labour would move, and that remaining behind might be absorbed by the other new industries in the Areas—for, if the experience of 1945-53 is a guide, these latter may grow.

Again, some firms in the Areas' new industries may not survive unfavourable economic conditions because they cannot

¹*Op. cit.*

²This figure is based on the 150,000 or so employed in new factory buildings, and about 100,000 finding work in the surplus war factories. It disregards the possibility that migration out of the Areas might have been larger than it was, but also it does not take credit for persons brought into work in other areas having surplus labour or for secondary employment.

reduce their costs sufficiently or otherwise adapt themselves. If the workpeople migrate to factories elsewhere which can make good the lost output, production need not suffer. Those who do not migrate might be absorbed by new firms that grow. For reasons given earlier, the mortality rate of the new firms in the Areas is unlikely to be gravely higher than the national average.

Still further, the new industry taken to the Areas during the period will check the migration of labour from them. If firms elsewhere were more capable of adding to industrial output, that would harm it. The harm could be mitigated if future policy were to facilitate migration from the Areas.

There are, however, favourable factors to set against these unfavourable ones. Firms in the Areas' new industries may become more efficient as time goes by—as existing labour acquires experience and skill, as new labour is reared in the required capacities, as the supply of technical and supervisory labour develops, as scale economies occur with growing size, and as external economies come into existence.

More important, some of the positive gains due to distribution of industry policy in the past nine years will endure. Perhaps the most significant gain is the bringing into work in the Areas of females and adult males not able to migrate who had no work before. Another is that by now many workpeople there are equipped with industrial training which fits them to move elsewhere with reasonable prospects of employment in diverse industries. That could provide a needed reservoir of trained labour for industries growing elsewhere, and so favour industrial output. The old industries of the Areas have become better equipped to produce because they have been enabled to improve their techniques and to make new products; been obliged by the entry of the new industries to deploy their labour forces better; and received varied stimuli from those industries. The relief of industrial congestion will be a continuing gain because it both avoids the wastes of output caused by that congestion and the need to devote resources to remedy it. The advantageous locations secured by firms outside the Areas, often partly by the help of the Board of Trade, will continue to

favour output. Last, the start made with the generation of industry in new towns may help these to become places favouring the growth of industries going there.

To deal next with the effects upon the balance of payments, the damage done to export and import-saving by the siting of new factory building where costs of production were higher than elsewhere is apparent. It is fortunate that the damage was confined to a minority of the firms sited in the Areas. There is an offset to the damage in that some of these minority schemes would otherwise have been carried out in places of labour shortage where further inflation of the demand for labour would have driven up its costs. The offset is of some importance, since foreign-trade industries are thick on the ground in labour-shortage areas—*e.g.* the two Midlands areas, London and districts around, the West and South Ridings of Yorkshire, and parts of Lancashire.

Harm was done also when new factory projects in domestic industries were permitted in exporting districts and reduced the labour and other resources available to the export firms. That occurred in the earlier years but not appreciably in later times. Moreover, the rigid ban initially imposed upon factory building in the congested parts of Greater London and the Birmingham conurbation protected the foreign-trade industries there from losses of labour and premises to both new incoming firms and existing firms not engaged in foreign trade. And as the relaxation in and after 1947 usually only applied to firms making foreign trade goods and defence products, that protection was maintained. The steering of new factory projects to the Areas did cause their export industries of iron and steel, shipbuilding, engineering and chemicals to lose labour to them ; but it has been concluded earlier that such losses were not heavy.

The check to migration from areas having surplus labour to foreign-trade industries areas was harmful. The greater obstacle, however, was the failure to increase housing sufficiently in these latter. It may be borne in mind, too, that nearly one-half of the estimated employment in new factory projects in the Areas was in their basic industries—which, directly, and indirectly, contributed substantially to the output of foreign-trade goods.

Finally, damage was done to the balance of payments when new factory building was approved for firms making only domestic market goods. That often occurred in the Areas during the first two years. Later, it was infrequent, because the Board of Trade favoured projects for the Areas of firms producing for export or import-saving. Besides, it has turned out that a number of the new factories in the Areas originally intended for making domestic market goods have managed to enter the export market—*e.g.* those making rayon, nylon, clothing, telephones, radio, accounting machinery, electric washing machines, glassware, electronic apparatus, plastics, light chemicals, sports goods and toys. Outside the Areas, of the total factory building schemes, the fraction concerned with investment goods and durable consumption goods was higher than the identical fraction for the manufacturing industry existing there before. That is important: for these types of industry are larger exporters than other types. The initiative in promoting the schemes came from the firms themselves; but the Board of Trade had some influence because it decided what schemes should be approved.

Against the above negative points, may be set some that are positive. Thus, the balance of payments position was helped by the increased aggregate industrial output which distribution of industry policy made possible. It was helped, too, by the simple fact that a control over new factory building was in existence; for this was certainly used to encourage new factory building for foreign-trade firms. It was further helped by the Board of Trade's readiness often to allow these to build in locations preferred by them. Last, the Board of Trade was active in encouraging foreign firms to establish themselves in this country, and in easing difficulties impeding their entry into production. Such firms not only helped to reduce imports but sometimes contributed to export.

It is hard to strike a balance between the opposed considerations. But the higher costs of some of the firms piloted to the Areas were probably not greatly significant during the sellers' markets existing during much of the period. What mattered more were the growth of industrial output generally,

and the official preference for new factory building intended to house firms making foreign-trade products.

Is this favourable verdict likely to apply in the more immediate future? The high-cost firms in the Areas will prejudice export : for costs are now of transcendent importance. Apart from costs, success in selling abroad will probably depend greatly upon the ability of industry to move resources out of the making of products suffering a fall of demand into the making of those for which demand is rising. This flexibility in deploying resources will be helped by what distribution of industry has done in the Areas—the greater diversity of their industrial structure, the training of labour in a wide range of modern techniques and the improved plants and new products of the old industries. In the rest of the country it has loosened the bonds constricting the freedom of firms in congested areas to manoeuvre, given firms in other areas much freedom to arrange their own new dispositions in both new factories and extended factories, and accelerated the movement into production for export by braking factory building by non-exporting firms. But it has somewhat checked expansionary firms, and hindered industry's ability in the rest of the country to undertake change by approving less than its share of new factory building. Yet both these drawbacks have been mitigated by allowing firms to have uncontrolled access to existing industrial premises and to build freely extensions of less than 5,000 square feet.

To consider now the effects upon unemployment, since the fundamental aim of distribution of industry policy was to reduce local unemployment, the discussion will be limited to this. The earlier analysis¹ concluded that the main factor causing low post-war unemployment in the Areas was general prosperity, but that the policy did play a part.

What, however, of the more immediate future? The Areas will continue to be more liable to unemployment than the country as a whole because they are more highly-specialised to a narrow range of industry, and so more exposed to structural unemployment ; more committed to investment and

¹p. 3.

durable consumption goods industries, and so more liable to cyclical unemployment ; their dominant industries are much engaged in foreign trade, and therefore sensitive to fluctuations in this ; and their basic industries may, on balance, contract. Distribution of industry action has reduced that liability—by reducing specialisation and aiding the specialised industries to become more efficient ; by reducing the proportion of investment goods and durable consumption goods industries through alternative new industry ; by fostering new factory schemes in export trades to improve their competitive ability ; and by encouraging new industries that may expand as the old ones contract.

Those who take the view that the best means of treating local unemployment is by national, or general, measures, may be disinclined to accept this verdict. There is not space to consider this issue here. Briefly, however, it may be suggested that the local measures embodied in distribution of industry policy are also needed because such general measures rely heavily upon migration from areas of local unemployment to where the general level of demand can be maintained. But migration does not clear the market—always some can't or won't migrate ; it is of limited use during cyclical depression—when the rest of the country also may suffer unemployment ; it does not avail against local structural unemployment, the true remedy for which is a change of local industrial structure.

Although the above-named verdict is held, it has to be qualified. The Development Areas as a whole are still more dependent upon industries vulnerable to economic fluctuation than the country as a whole, and individual Areas are more dependent than others—*e.g.* the Scottish and Merseyside Areas are. Again, particular parts of the Areas—named earlier—have benefited little from alternative, new industry. Outside the Development Areas there are districts and places that, being abnormally engaged upon export, or upon investment goods and durable consumption goods industries, or upon industries that may stagnate or even contract, are more exposed to the risk of unemployment than the country generally ; and distribution of industry policy has not yet paid much regard to them.

IV

Finally, it is necessary to take a realistic view of distribution of industry policy, so that its effects are not exaggerated. The important fact is that, even in the period of nine years, the total new space created by the new factory building is no more than a small fraction of the total factory space in existence when distribution of industry policy was started. The total changes of location wrought by it have therefore not been substantial. And since the factory space accounted for by extensions has been larger than that devoted to new factories, there has been no significant departure from the pre-1945 pattern of industrial location.

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The Monopolies Commission and Economic Welfare

The principle aim of this article is to ascertain the relationship of monopoly to economic welfare as seen through the investigations and recommendations of the British Monopolies Commission in its search for "the public interest."¹ This involves giving an account of the guiding principles used by the Commission showing their connections to different theories of economic welfare. This approach has the incidental value that it provides, through the eyes of a body of experienced men examining the actual working operations of sections of the economy, an interesting interpretation of the nature of economic welfare.

No comment will be offered on the rightness or wrongness of the Commission's decisions, in individual cases, or in general. The only point that requires to be noted in this connection is that under the very general terms of reference in the 1948 Act the Commission is not restricted in its observations and recommendations by any narrow legislative directions. It is free to come to any decision which the merits of a case appear to deserve. Nor will anything be said about the appropriateness of the Monopolies and Restrictive Practices Acts 1948 and 1953, or the remedies employed by the Government to enforce the

¹There are now eight reports of the Commission "covering as wide a range as possible of the different types of alleged restrictive practices and monopolistic influences in British Industry" (Board of Trade evidence in the 6th Report from the Select Committee on Estimates, 1952-3). The reports are (H.M.S.O.) :—

Report on the Supply of Dental Goods, December, 1950.

Report on the Supply of Cast Iron Rainwater Goods, March, 1951.

Report on the Supply of Electric Lamps, October, 1951.

Report on the Supply of Electric Wires and Cables, June, 1952.

Report on the Supply of Insulin, October, 1952.

Report on the Supply and Export of Matches and the Supply of Match Making Machinery, May, 1953.

Report on the Supply of Imported Timber, October, 1953.

Report on the Process of Calico Printing, April, 1954.

Acts. These important subjects have received ample comment elsewhere.¹

An interesting preliminary point is that modern welfare economics appears to have no place in the reports of the Commission. There is no evidence of any concern for a correct allocation of resources by means of such devices as a price equal (or proportional) to marginal cost "rule," or a calculation of the degree of monopoly.² The omission of this type of welfare technique is especially noticeable by contrast with the very considerable attention given, in the recent past, to the elucidation of a desirable pricing policy for statutory monopolies (nationalised industries) by means of precisely such methods. A priori one would say that the absence of modern welfare economics from the reports is due to the ultra-abstract nature of this branch of theory. For example, the rule that a price equal to marginal cost for all production units creates an optimum allocation of resources is correct only as a statement of certain hypothetical relationships. But in the application of welfare theorems the only situation capable of spontaneously realising this result is that of the very untypical purely competitive market. In practice, the welfare economist's "degree of monopoly" turns out to be a measure of the deviation from pure competition.³ No one seriously suggests a return to the

¹See Ruth Cohen, "New British Law on Monopoly," *American Economic Review*, March, 1949 and "Reports of the Commission on Monopolies," *Economic Journal*, March, 1953; C. D. Harbury and L. J. Raskind, "The British Approach to Monopoly Control," *Quarterly Journal of Economics*, August, 1953; A. Kilroy, "The Task and Methods of The Monopolies Commission," *Manchester School*, January, 1954; W. A. Lewis, "The British Monopolies Act," *Manchester School*, May, 1949 and *Overhead Costs*, Ch. 6; H. Clay, "The Campaign Against Monopolies and Restrictive Practices," *Lloyd's Bank Review*, April, 1952; and P. H. Guenault and J. M. Jackson, "British Monopoly Legislation in Practice," *Canadian Journal of Economics and Political Science*, May, 1954.

²By "modern welfare economics" is meant the current school of thought which bases welfare models upon the ordinal techniques of analysis pioneered by Pareto. Cf. for example, I. M. D. Little, *Critique of Welfare Economics* and M. W. Reder, *Studies in the Theory of Welfare Economics*. See A. P. Lerner, *Economics of Control*, p. 64, and *Review of Economic Studies*, 1934, pp. 157-65, also R. F. Kahn, "Notes on Ideal Output," *Economic Journal*, 1935, pp. 1-35, for marginal costing "rules" and the "degree of monopoly."

³Cf. F. Machlup, *Political Economy of Monopoly*, pp. 526, and K. Boulding, *Survey of Contemporary Economics*, Vol. 2, pp. 23-4.

small-scale, homogeneous-product enterprises necessary for pure competition. Nor would anyone suggest that the advantages of scale or the conveniences of differentiated products be judged by the criteria of a hypothetical economic order. The real world of competition is one in which most producers, for one reason or another, some good some bad, are confronted with a demand curve of finite elasticity ; and it is difficult to see how one can read into this degree of deviation from pure competition an unequivocal measure of economic loss to the community. There is further the practical consideration that marginal costing techniques in some cases simply cannot measure monopoly although monopoly undoubtedly exists. The restrictive effort of an industry may, for instance, be directed towards maintaining itself in business by means of devices to exclude new entrants rather than towards any attempt to restrict output and earn monopoly profits. In such cases there need be no unusual divergence of price and marginal cost. And, in fact, we find that the majority of the Commission's reports deal with restrictive practices arising from such "security" motives. In sum, it is unlikely that the Commission would consider the theoretical approach of modern welfare economics appropriate to its problems. It is a theory orientated towards an irrelevant type of market structure. It is capable of saying only one thing about industry and economic welfare—that welfare is increased or decreased by respectively correct or incorrect allocation of resources—and has nothing to say concerning other possible sources of economic welfare. Finally, it has the overwhelmingly serious practical disadvantage that its sole criterion, divergence of price and marginal cost, is no guide for an important class of monopoly restriction.

The welfare considerations which are in fact adopted by the Commission are of a nature distinctly different from the allocative techniques of welfare economics. It is notable, first of all, that costs are not ignored. Indeed a complete chapter is given over in each report to considerable detail on costs, prices, and profits. But the Commission uses this material to concentrate on the relationship between *average* costs and price—that is on the rate of profit. Yet despite the attention given to the profit rate it is clear that it is not necessarily a decisive or

even an important factor in reaching a decision. Much more influential in the Commission's thinking, in fact it may be said to be central to the approach to each investigation, is a pre-occupation with removing restrictions on the freedom of entry into industry. This is a theme in the reports which is developed in section I of the article. However, free entry does not account for all of the decisions of the Commission. A significant minority of its recommendations are evidently influenced by other doctrines; namely, by ideas connected with the theoretical positions of J. A. Schumpeter and J. K. Galbraith. Section II elaborates the nature of these important exceptions to the traditional doctrine of free entry.

I

The welfare approach to which the Monopolies Commission appears, in the main, to be devoted is the fairly simple, and traditional, idea of "free entry." Free entry is a necessary assumption underlying the allocative model of the modern welfare economist; but it is an idea more usually associated with less formal, and perhaps more ideological, theories of economic welfare. Marshall's "Principles" contains, implicitly, a welfare approach of the type under discussion. Marshall was a pioneer in certain branches of welfare analysis, notably in his surplus theory and his monopoly theory; but he evidently thought of these branches as "exceptions"¹ to the doctrine that maximum satisfaction is to be obtained from what he called "Freedom of Industry and Enterprise." By this phrase he meant essentially, organisational and legal arrangements permitting and encouraging free movement into industry.²

A more explicit and up-to-date statement of this position on economic welfare, one which is sharply critical of the modern school of welfare economics, is given by Professor Hayek in his essay "The Meaning of Competition."³ "The argument in favour of competition does not rest on the conditions that would exist if it were perfect . . . Even where free entry will secure no more than that at any one moment all the goods and services

¹See H. Myint, *Theories of Welfare Economics*, p. 124, *et passim*.

²*Principles*, 8th ed., especially Bk. I, pp. 8-10, and Bk. V, ch. 5 and 13-15.

³Printed in *Individualism and Economic Order*.

for which there would be an effective demand if they were available are in fact produced at the least current expenditure of resources at which, in the given historical situation, they can be produced . . . this, I submit, is more than we can expect from any other known system. The decisive point is still the elementary one that it is most unlikely that, without artificial obstacles . . . , any commodity or service will for any length of time be available at a price at which outsiders could expect a more than normal profit if they entered the field." "Much more serious than the fact that prices may not correspond to marginal cost is the fact that, with an intrenched monopoly, costs are likely to be much higher than is necessary."

In brief, free entry is the main criterion of a theory in which actual (as distinct from analytical) competition is the chief ingredient necessary for the increase of economic welfare. Free entry, or unrestricted competition, is here not simply an implied aspect of a static system for the correct allocation of resources. It is instead, through its necessity for the exercise of innovation, of enterprise, of general intensity of competitive effort, the active agent in cost reducing and welfare increasing processes.¹ An important passage from the conclusion of the first report of the Monopolies Commission, on the *Supply of Dental Goods*, provides a revealing example of this view of economic welfare. In spite of the fact that the Commission did not find "any great abuse" of its powers the report commented strongly on the activities of the Association of Dental Manufacturers and Traders: "When an association covering so large a proportion of the industry arms itself with these far-reaching powers [of control of entry and terms of trading] it becomes self-perpetuating because of the risk involved [for members] in leaving it, and there is no adequate safeguard to prevent it from restricting competition to an extreme degree, maintaining prices and margins at unnecessarily high levels, hampering the development of any progressive makers or traders outside of the

¹The allocation of resources problem is not, of course, neglected by the traditional free entry approach. Implicit is the idea that, besides providing for innovation and change, unrestricted competition also, by selecting the more efficient resources to remain in the industry, and compelling inefficient resources to seek employment elsewhere, is constantly working towards a distribution of resources according to the public interest.

association and restraining and restricting innovations in methods of distribution by its members.”¹

Further study of the reports reveals the considerable extent to which obstruction of free entry figures in the Commission's considerations of “the public interest.”²

From the reports one finds that monopolistic practices are usually, although not always, manipulated through the activities of a trade association. Even such giants as Associated Electrical Industries, the General Electric Company, and I.C.I. feel compelled to operate some of their activities through the appropriate trade association. (*Electric Lamps* and *Dental Goods* Reports). The motives are the usual monopolistic motives: to make profits greater than those possible under competitive conditions and/or protect business interests from the hazards of competition.³ The usual means, the fixing of common prices, restriction of output by one method or another, demarcation of quality and variety of the commodities produced, etc., are employed. But more interesting and important is how the trade association preserves its monopolistic position from the erosion of outside competition. This is a strategic element in every situation which the Commission attempts to discover and remedy.

The technique most frequently uncovered by the Commission's inquiries is that known as “exclusive dealing.” Exclusive dealing can be imposed by producers, upon distributors (as in *Dental Goods* and *Electric Lamps*). That is, distributors are forbidden in their agreements with the producers' association to deal in goods originating outside of that association. Thus producers who are not members of the association are excluded from a considerable number of trade outlets. Contrariwise, exclusive dealing may be imposed, by distributors, upon producers (*e.g.* the foreign shippers in

¹Paras. 223-4.

²The Appendix contains the essentials of each report arranged under headings which make the reports comparable. The remainder of the article should be read with reference to this table.

³Where security is the motive, as it frequently is, high prices or high profits are not decisive guides. In the reports they are always considered, but are clearly only one of a number of factors used to reach a conclusion.

Imported Timber). Such producers are prevented from distributing their goods through agents not members of the distributors' association. Thus certain distributors are excluded from dealing in a number of lines of goods. A further possibility is that where bargaining power is fairly evenly balanced the distributors' and producers' associations may agree to grant one another reciprocal exclusive dealing concessions to their mutual benefit (as in *Rainwater Goods* and *Imported Timber*): However, an agreement for exclusive dealing is, by itself, not enough to maintain the restrictive practice. Distributors may, unobtrusively, sell goods originating from non-signatory producers, thus breaking down to some extent the monopoly restriction of the producers' association. Or producers may attempt to widen individual markets by selling goods through non-signatory distributors, or directly to customers, thus damaging the protective policy of the distributors' association, and possibly the restrictive policy of their own producers' association also. Consequently, an essential element of exclusive dealing practices is some form of enforcement in order to keep individual members in line with agreements. Discipline may be provided by the "collective boycott"; that is, collective refusal on the part of producers to supply those distributors who do not keep to the articles of the agreement; or alternatively, refusal, on the part of distributors, to handle the goods of producers who infringe their side of an exclusive dealing arrangement. The boycott, administratively speaking, is in the form of a "stop list" or "black list" for business under pressure to conform (*Dental Goods*, *Electric Lamps* and *Rainwater Goods*); or a "white list" or "approved list" for business which is approved for the purpose of the agreement. Or, discipline may be exercised through fines imposed by the trade association on its members; or by the threat of expulsion from the association and consequent loss of business and perhaps livelihood (*Electric Lamps* and *Dental Goods*). Again, incentives may be used to make the industry conform; that is, the exclusive dealing may be maintained by offering "deferred" or "loyalty" rebates payable retrospectively for good behaviour; or by offering special "association" rebates to signatories of the distributors' agreement (*Electric Cables* and *Electric Lamps*).

Besides, or instead of, exclusive dealing, the trade association may practice collectively imposed resale price maintenance—a “price ring” (e.g. *Electric Lamps* and *Calico Printing*). The association here uses its power of boycott, or its power to withdraw association rebates, deferred rebates, etc., for the slightly less restrictive practice of enforcing its common price policy.

The above practices are capable of disciplining existing producer and distributor members of trade associations. But a further condition may be necessary for complete enforcement. Entry into the association must not be too easy or else membership of the association may become co-terminous with membership of the industry and the restrictive, and advantageous, character of membership of the association will disappear. And in fact we find from the reports that restriction of the membership of trade associations—on various grounds of lack of experience, lack of technical qualifications, lack of a “necessary” minimum turnover of trade, etc.—is frequently employed as part of the system of restriction of entry (*Dental Goods*, *Electric Lamps*, and *Imported Timber*).

These are the techniques based upon control over the membership of a trade association. But the reports also show that trade associations do not despise the perhaps better known direct methods for restricting entry usually associated with the spectacular single giant monopolist. That is, trade associations on occasion also acquire control over raw materials and components of the industry in order to starve non-members of supply or else put them at a competitive disadvantage by charging a discriminatory high price for them ; or they acquire control of machinery supplies, or patent rights ; or they create “fighting companies” to under-cut outside competition ; or they attempt to buy up competitors or covenant them to remain outside of the industry. (e.g. *Electric Lamps*, *Rainwater Goods* and *Calico Printing*).

These direct methods have their importance. Nevertheless judged by the reports published so far, they are subsidiary in most British industries to the restrictive techniques based upon control of the membership of a trade association. In only one of eight reports to date (*Matches and Match Machinery*) was

the industry found to rely upon the direct aggressive approach (fighting companies, patent litigation, mergers, etc.) for its main restrictive effort. And significantly, this is an industry in which a single large company, and not a trade association, is the dominating influence.¹

The discovery and elimination of these practices all designed to restrict entry either directly or through trade associations, occupy the bulk of the Commission's inquiries and conclusions.²

The above description of monopolistic practices condensed from the reports suggests a Monopolies Commission which sees economic welfare, "the public interest," primarily in terms of free entry into industry. This is an interpretation confirmed by the nature of the Commission's recommendations which (with a few important exceptions to be noted in section II) are all concerned, directly or indirectly, with practices which restrict entry of competition. Further confirmation can be found in the fact that the Commission's "empirical" ³ approach through "the accumulation of case studies" appears to have led, in its first "general" inquiry, to investigations of important aspects of this problem of free entry. Section 15 of the 1948 Act authorises "general reports" dealing with the effects, on all industry, of "specified practices." On the 17th December, 1952, the Board of Trade made, under this section, a reference to the Commission which is clearly designed to examine the effects of the practices of exclusive dealing, collective boycott, and

¹The prevalence, in the Commission's reports, of restrictive practices operated through trade associations over cases of "large scale" monopoly is an interesting phenomenon in British industry. The 1953 Annual Report on the 1948 and 1953 Acts, published by the Board of Trade, appears to suggest that this trend will continue. In a review of suggestions and requests made to date, for reference to the Commission, the Annual Report distinguishes four categories: (1) Discriminating arrangements against a defined class of customer, (2) Agreement to fix common or minimum prices, (3) Other arrangements or agreements coming within the scope of the 1948 Act, (4) Monopolies—the concentration of business in the hands of one or two large concerns. This fourth category accounts for only ten out of a total of forty-one suggestions.

²Cf. the Appendix and Reports.

³Cf. Dame Alix Kilroy, a former secretary of the Monopolies Commission, *op. cit.*, p. 37; also a speech by the President of the Board of Trade, Wednesday, 23rd July, 1952 (House of Commons Official Report, Cols. 571-3).

loyalty and association rebates.¹ Presumably this reference is a preliminary stage to the passing of general legislation against these widely prevalent restrictions on entry. This would be a logical outcome of the Commission's preoccupation with the importance of free entry.²

II

It has been seen that free entry is the main criterion used by the Monopolies Commission in its investigations and recommendations. There is what amounts to a strong presumption for its restoration in each case. Nevertheless, there is evidence that the Commission, upon examination of certain significant factors, has been led to qualify this and give consideration to other criteria of economic welfare.

The first exception is that provided by the situation in which a monopolist, or a monopolistic group, has its market power opposed by a monopsonistic or near-monopsonistic buyer of its commodities. In this case the Commission is not too concerned about the dangers of the situation and makes no attempt to break up the monopoly or regulate it through the usual price control machinery. The best example of this is to be found in the *Electric Cables* Report. In the case of mains and super-tension cable, of which the British Electricity Authority buys respectively 73% and 87% of the total output, the Commission recommended that this nationalised industry should, assisted by independent cost accountants to cost the factories of the Cables Makers Association, negotiate with the C.M.A. on the prices of these products.³ No other price or profit regulation in these products was recommended. Similarly in the case of submarine telegraph cable, of which 100% is bought by the G.P.O., the Admiralty, and Cable and Wireless, the G.P.O. was recommended to continue and to extend its cost investigations of this section of the industry.⁴ And in the land telephone section of the industry the G.P.O. was again recommended to use its very considerable buying power of 90% of the

¹Evidence given in the 6th Report from the Select Committee on Estimates (1952-3) gives the text of the reference.

²Cf. Speech of President of Board of Trade, *op. cit.*

³Para. 278.

⁴Paras. 288-9.

output in order to allocate more of its orders with independent competitors, and also to extend its "bulk-order" system outside of the C.M.A. group.¹ Another example is to be found in the *Insulin* Report. Undoubtedly one factor influencing the Commission's decision not to make any recommendations in respect of the complete monopoly of the British Insulin Manufacturers was that the bulk of the product of this association was purchased by the Health Service and consequently the Commission was in a position to suggest that the appropriate government departments should take note of these prices and profits and if necessary exercise supervision over them.² A third example is the dissenting opinion of three members of the Commission on the *Match* Report. Rather than have the government impose price control on the match industry as it stood, which was the majority recommendation, these three members suggested an alteration in the structure of the industry by means of setting up a government purchasing agency with exclusive purchasing powers over all imported or home produced matches. To exert its monopsonistic powers this agency would be given powers to obtain full information on costs from manufacturers, and it would operate by obtaining orders from buyers and then placing its contracts competitively.³

The appearance of these factors in recommendations suggests that the Commission has taken account of what has come to be called "countervailing power" after the terminology of Professor J. K. Galbraith.⁴ The "theory of countervailing power" is primarily a positive theory showing how market processes actually operate in a modern economy. But it also has its welfare aspects in that it attempts to show that large scale monopoly or oligopoly, although inevitable in an advanced industrial society, is not nearly as socially undesirable a phenomenon as is frequently imagined. Professor Galbraith points out the familiar advantages of large-scale industry in its capacity for research and development. But the essence of his theory is that although modern large-scale industry throws up

¹Paras. 290-6.

²Para. 98.

³Para. 231. Two of the three dissenting members were Professor G. C. Allen and Mrs. Joan Robinson.

⁴J. K. Galbraith, *American Capitalism*, ch. 5.

positions of great monopolistic power for certain manufacturers, this often, though not always, stimulates "middle men," retailers or consumers to set up their own monopsonistic organisation to offset the market power of the monopolist. Examples which are given are the developments of chain stores, mail-order houses, consumer co-operatives, trade unions, etc. Countervailing power is, according to Galbraith, a "self generating regulatory force," which, although not operating in precisely the same fashion as traditional forms of competition, "does operate in the right direction."¹ That is to say, countervailing power reduces prices and profits of the monopolistic producer, and while it does not allocate resources ideally, it eliminates the monopolistic restrictions of the large producer on output, variety, quality, etc., and therefore compels a more desirable use of resources.

It is difficult to share the optimism of Professor Galbraith that countervailing power will replace the traditional form of competition among a number of producers and be a regulatory force in most cases of large-scale monopoly or oligopoly.² He himself does not provide sufficient evidence to demonstrate that there is a comprehensive practice of the principle in United States conditions. And certainly, for Britain, the reports of the Commission do not provide support for this thesis. In only two cases does countervailing power appear to have developed satisfactorily (*Electric Cables* and *Insulin*) and in both these cases the vehicle has not been any "self generating" market process but instead the apparently accidental emergence of a government department or a nationalised industry as the chief buyer of the products. In addition the "self-generating" qualities of countervailing power were conspicuously absent in such cases as the Match Industry and the Dental Goods industry where, according to the theory, they should have been most prominent.³

On the other hand, leaving aside the theoretical point, it is evident from the examples cited above that the Commission

¹*Ibid.*, p. 119-20 and p. 175.

²*Ibid.*, p. 120.

³There was some limited development of "countervailing power" in *Electric Lamps* (para. 115-122).

agrees with Professor Galbraith's practical point¹ that countervailing power can be a useful, and important, device for offsetting monopolistic power in certain situations without having the Commission resort to cumbersome price and profit regulation machinery, or the breaking up of price rings. The *Electric Cables* Report can reflect the Commission's opinion on this point: "It does not seem to us . . . that this situation in which a near monopoly buyer faces a near monopoly seller should or could be transformed into one of ordinary competition. In our opinion the B.E.A. (British Electricity Authority) is strong enough to buy at reasonable prices. A system of purchase which is in the long term interests both of the consumer and of the producer will have to be worked out by the B.E.A. with the industry."²

The second exception to the usual principle of unrestricted competition is probably the more important one. There is evidence in the reports that the Commission has been compelled, on occasion, to think in terms of monopoly, not as an obstacle to, but as a provider of economic welfare. As is well known this is a doctrine associated with the name of the late Professor J. A. Schumpeter. The basis of the Schumpeter approach may be said to be contained in two key ideas: that "a first test of economic performance is total output," not allocative efficiency; and that the growth of output per head in the modern capitalist economy is primarily the result of the activities of the large oligopolistic or monopolistic firms which alone have the finance, the research facilities, and the administrative talent necessary for developing the new technique or the new product upon which the growth of wealth depends. Competition by innovation is the key to economic welfare and "it becomes a matter of comparative indifference whether competition in the ordinary sense functions more or less promptly."³ Such ideas lead logically to the position that many monopolistic practices may be necessary for economic progress—necessary because they are allies of innovation. Monopolistic restriction can be an ally because innovations are nowadays

¹*Ibid.*, ch. 10 on "Countervailing power and the State."

²Para. 278.

³J. A. Schumpeter, *Capitalism, Socialism, and Democracy*, ch. 5-8, and especially p. 63 and 82-5.

usually expensive; and if expensive, require some form of insurance or protection before they will be undertaken. The protection given by patent law, normally accepted in industrial society, is here only one of a large class of devices, which could include resale price maintenance, exclusive dealing agreements, even the acquisition of financial control over competitors, designed to cover the risk involved in expensive innovation such as introducing a new process or placing a new product on the market. Even high profits, where they are realised by such policies, can be viewed as having the welfare function of providing "the baits that lure capital on untried trails."¹ On the basis of these views of the effect of monopoly on economic welfare Schumpeter maintains that there is a strong case for interpreting monopolistic restrictions in the light of new principles. He advocates a "rational" as distinct from a "vindictive" regulation of monopoly.²

What is lacking in Schumpeter's theory, as Professor E. S. Mason points out, is satisfactory evidence that large-scale enterprise is necessarily the more efficient, and that innovation is usually the product of the large firms of the economy. Also he fails to provide criteria with which to distinguish "expansive" from "restrictive" monopoly practices. Nevertheless there is sufficient in Schumpeter's case to contain "in terms of practical application . . . a useful admonition that the existence of a large firm or a few large firms is not necessarily incompatible with effective competition."³ There are signs in the reports of the Monopolies Commission that this is probably also the view of the Monopolies Commission although, in its practices in this field, it is not prepared to go as far as Schumpeter and accept all classes of monopolistic restrictions in its name. On the other hand the Commission is prepared to make concessions where the large-scale organisation, whether it be a single firm or a trade association, shows signs of contributing to economic welfare through development, innovation and low costs of production.

¹*Ibid.*, p. 87-90.

²*Ibid.*, p. 91. Schumpeter's criticisms of "indiscriminate trust-busting" were of course directed mainly at United States' policies.

³Edward S. Mason, "Schumpeter on Monopoly and the Large Firm," *Review of Economics and Statistics*, May, 1951, pp. 140-143.

One of the reports most indicative of this view is the *Insulin Report*. The potentiality for abuse was very great in this industry where the three manufacturers combined to buy and allocate raw materials, to manufacture the product and set the retail price. Also the factor of "natural" monopoly was considerable due to the technical difficulties of production and the legislative requirements in standards and distribution. The fact that the set prices were found to be "reasonable" and that there was no evidence of restriction of entry did not alter the dangers of the situation.¹ Nevertheless, the Commission offered no recommendations to make this industry competitive in price or any other sense. The significant parts of the report which led to this conclusion are those which deal, in almost eulogistic terms, with the results of the industry's collective research and technical collaboration programmes in giving greater yields from scarce raw materials, a better quality of product, and virtually the lowest priced insulin in the world.² This was indeed a case of a monopolistic organisation setting a pace, through innovation and development, unlikely to be equalled by competitive methods.

Further evidence for this view of economic welfare is to be found in the *Electric Lamps Report*. The Commission noted that the results of E.L.M.A.'s policy of sharing patents, manufacturing technique and research results were "A more rapid and comprehensive exchange of information about new developments, . . . the more rapid application of new discoveries" and "a progressive and substantial reduction in the prices of Lamps." Consequently, while the Commission recommended that the numerous restrictive entry practices of the Association such as exclusive dealing, deferred rebates, restriction of materials, etc., be discontinued, it was prepared to make the concession that the "E.L.M.A. system" should continue to fix "reasonable" *minimum* prices of lamps providing that the exchange of technical knowledge be extended to all manufacturers who kept to this minimum price system.³ That is, the price ring was left

¹The only safeguard was that the Ministry of Health was in a position to exercise "countervailing power." See above, p. 32.

²Paras. 69-72, 86-90, and 96-101.

³Paras. 275 and 263.

intact, with certain provisos, in order to conserve the innovatory advantages considered inseparable from its operation. Similarly, the *Electric Cables* Report stresses certain technical advantages associated with the otherwise restrictive operations of the trade associations. It brings out the fact that the C.M.A. and C.C.A. systems are "much more than price rings" since a leading feature of their arrangements has been to establish minimum standards and a high level of quality. The United Kingdom industry as a result "has been the leader in cable development and production" with "the largest cable export trade in the world." Most sections of the industry were recommended to fix prices by agreement with monoponic buyers; but in the Rubber Cable and Covered Conductors sections, where this was not feasible, the Commission again allowed the concession of *minimum* price-fixing.¹

The *Match* Report also has passages which reflect this awareness of the benefits of monopoly. In spite of the very dubious practices of the British Match Corporation which were instrumental in the creation of its present dominating position, the Commission was compelled to admit that there was "some force" in the arguments that it would not be a feasible plan to break up the B.M.C. into two or three competing companies since it appeared from the experience of several countries that a monopoly "is probably the natural organisation for this trade"; and also that it was a more economical practice to restrict match machinery design and manufacture in Britain and concentrate it instead with the Swedish member of the international match cartel. It is significant further that the industry was, in the event, not broken up, nor was its trading agreement to share the British match market with the Swedish Match Company terminated; and the Commission's main recommendation in this report was simply to impose price control of the industry by the Government.²

¹Paras. 283 and 287.

²Paras. 212 and 218-225.

III

The first conclusion which must be drawn concerning the principle guiding the Monopolies Commission in its search for an increase in economic welfare is that it has a working (not an ideological) presumption in favour of free entry or unrestricted competition of the traditional type. This is an interpretation borne out, not only by the weight of the "free entry" recommendations, but also by the spirit in which the facts of each case are developed. It is evident that other criteria are brought into consideration only when it becomes clear that, on balance, the situation indicates that no advantage to the public interest will be gained by insistence on traditional forms of competition. Nevertheless, the reports make equally clear the further conclusion that the Commission has an open mind and is willing to give consideration, and trial, to other theories of welfare where it considers they have appropriate application. There is no unnecessary nostalgia for *laissez-faire*.

Concerning the nature of economic welfare in an industrial society the Monopolies Commission, by reason of the very general instructions of the 1948 Act and its wide powers of investigation into the working processes of the economy, is in an excellent position to provide some interesting insight. It would seem, perhaps not surprisingly, that economic welfare is not a one-sided idea. It is not only or even mainly concerned with a correct allocation of resources as can be seen from the absence of marginal cost pricing techniques and from the fact that the Commission is satisfied, where this is feasible, to offset monopoly power by means of the somewhat crude device of monopsony power. On the other hand the idea of economic progress (of changing the technical conditions assumed by a system of optimum allocation instead of making the best of them) is clearly evident in the Commission's prime anxiety to keep an industry open to the entry of new blood and new ideas. Further, where entry is made difficult through obstacles of finance, technical complexity, large size of the existing firms of the industry, etc., the Commission is willing to concede the value of large-scale organisation and collaboration only if the occupants of this "natural" monopoly position demonstrate

that economic progress is not being allowed to stagnate in their hands. The emphasis here is again quite different from that of the current school of theoretical welfare economics.

By and large, correct allocation of resources is apparently thought to look after itself if competition of some description is present. Whereas, the importance of innovation through free entry or any other practicable method which does not exclude new ideas may be said to be fundamental to the Commission's view of economic welfare.

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	Dental	Rain-water	Lamps	Cables	Insulin	Matches	Timber	Calico Printing
Restrictive Practices								
Price Fixing	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Quota System	Yes	No	Yes	Yes	Yes	Yes	No	Yes
Exclusive Dealing	Yes	Yes	Yes	Yes	No	...	Yes	No
Discriminating Rebates	...	Yes	Yes	Yes	No	...	No	No
Collective Boycott	Yes	Yes	Yes	No	No	...	No	No
Restrictive Membership of Ass.	Yes	Yes	...	No	No	...	Yes	No
Patents Restriction	No	...	Yes	No	No	...	...	No
Fighting Companies	No	...	Yes	No	No	Yes	...	No
Restriction of Supply (of materials, machinery, etc.) to Competitors	No	...	Yes	No	No	Yes	...	Yes
Effects on Industry								
High Profits	Yes	No	Yes	...	...	Yes	...	...
New Entry Hindered	Yes	Yes	...	No	No	Yes	Yes	Yes
Exchange of Information	...	...	Yes	Yes	Yes	Yes	...	...
Innovation Advanced	...	No	Yes	Yes	Yes	...	No	No
Recommendations								
Discontinue Price-Fixing	Yes	Yes	No	No	No	...	...	Yes
„ Quotas	Yes	...	Yes	Yes	No	No ⁽²⁾	...	Yes
„ Exclusive Dealing	Yes	Yes	Yes	Yes	...	...	Yes	...
„ Discriminatory Rebates	...	Yes	Yes	Yes	...	...	...	...
„ Collective Boycott	Yes	Yes	Yes	...	...	...	...	...
„ Restrictive Membership	Yes	Yes	...	...	...	...	Yes	...
„ Patent Restriction	...	...	Yes	...	...	...	...	...
„ Fighting Companies	...	...	Yes	...	...	Yes	...	...
„ Restriction of Supply	...	...	Yes	...	...	Yes	...	Yes
Price Control	No	Yes	No	No	No	Yes	...	No
Govt. Costing or Price Surveillance	No	No	No	Yes	Yes	Yes	...	No
Govt. Controlled Competition	No	No	No ⁽¹⁾	No	No	No ⁽²⁾	...	No
Break Up Combine	No	No	No	No	No	No	...	No

“...” indicates irrelevance or no definite conclusion reached.

⁽¹⁾ The recommendation of the majority; a minority of the committee recommended in favour of competition controlled by the government.

⁽²⁾ The Minority Report recommended that quotas be discontinued.

⁽³⁾ The Minority Report recommended in favour of government-controlled competition.

The Prospects of British Shipbuilding

The past fifteen years has been a period of unbroken prosperity for the British shipbuilding industry. During the war the industry's resources were concentrated on the production of naval tonnage, and with the end of hostilities heavy demands for new mercantile tonnage were to be expected. War losses had been exceedingly heavy, British losses alone amounting to 8,738,000 gross tons, almost half the merchant fleet afloat in 1939. In addition to the task of restoring British shipping, the restrictions imposed upon shipbuilding in former enemy countries, the dislocation and destruction of plant and equipment in occupied countries, meant that British yards were called upon to tackle an unprecedented flow of foreign orders. In the eight years from the beginning of 1946 to the end of 1953, approximately 10 million gross tons of shipping with an estimated value of £825 mn. was produced from British yards of which, a third was for export.

In the immediate post-war years output was restricted by a shortage of steel and skilled labour, and the pressure on the shipyards for repairs, reconditioning and reconversion, yet by December 1949 the British mercantile marine had been restored to its pre-war tonnage, and world tonnage had increased by nearly 13 mn. gross tons as compared with July, 1945. Thus within four-and-a-half years of the end of the war the more urgent demands had been met, and it was forecast that by the end of 1950, some 188 building berths would be vacant and 75,000 workers redundant. But the short run prospects of the industry were completely changed by the Korean War, general rearmament and a continuing strong demand for tanker tonnage. New orders for merchant ships reached an all time record of 4,152,000 gross tons in 1951, and by June, 1952, the industry's order book stood at the record figure of 7,009,000 gross tons. But this "boom" in the demand for new ships was short lived, and during the past eighteen months the outlook for the industry has once again changed completely. Output continues at a high level, but the tendency for new orders to fall off, noticeable in 1952, became more marked during 1953,

when they fell to 520,000 gross tons, nor was there any improvement during the first six months of 1954. Figures issued by the Shipbuilding Conference show that total orders booked by shipyards in the United Kingdom amounted to 133 ships of 232,000 gross tons while at the same time, 14 ships of 155,000 gross tons were cancelled.

TABLE I
SHIPBUILDING ORDERS 1951-1954

New Orders			Total Orders (June)	
	No.	Gross Tons	No.	Gross Tons
1951	709	4,150,000	—	—
1952	244	1,200,000	1,135	7,009,000
1953	169	520,000	925	6,117,000
1954 (6 mths.)	133	232,000	804	4,864,000

At the end of June, 1954, the order book stood at 4,864,000 gross tons, and although this was 2 mn. gross tons less than it had been two years previously, with an annual launching rate of 1.5 mn. gross tons it still represented between three and four years work. But it concealed the important fact that on the same date, oil tankers, the majority of them vessels of substantial size, accounted for 51.7 per cent. of the tonnage under construction, and 55.8 per cent. of the tonnage for which plans had been approved or materials ordered, but which had not yet been commenced.¹ For many years the size of oil tankers had been restricted by the facilities for handling vessels at the unloading ports, and one of the most important consequences of the expansion of refining capacity in Western Europe has been the increase in the size of tankers that can be employed. The trend towards a bigger ship is seen in the size of tankers that were under construction in the world at the 30th June, 1954. Of the tankers of 5,000 tons d.w. and over under construction, 246 were vessels of 16,000 tons d.w. or over ; 151 were of 24,000 tons d.w. or over ; there were 10 of 38,000 tons d.w. ;

¹*Lloyds Register : Shipbuilding Returns*, June, 1954.

and two building in the United Kingdom were of 47,000 tons d.w.¹ Very few yards in the United Kingdom are capable of building ships of this size, and it has been estimated "that one-third of the yards account for over two-thirds of the shipbuilding output of this country; the remaining two-thirds of the yards accounting for the balance which comprises the smaller type of tankers, cargo vessels, coaster, colliers, tugs and a great variety of other types."² This high proportion of tankers together with the substantial tonnage of liners now building³ means that although the larger yards are fairly well placed, there is little work available for the smaller shipyards. This is particularly true of the Scottish yards (except the Clyde) and the smaller yards around the coast which specialise in building small and medium size cargo ships.

The demand for new ships depends on the supply of transport capacity in relation to the demand for shipping space, and this relationship in turn depends on a number of factors, of which the volume and pattern of international trade, and the size and speed of the existing fleet are the most important. The quantum of world exports compiled by the United Nations shows that world trade measured by volume of goods exported, has, apart from a slight set back in 1952, increased steadily since the war, and the index (1948 = 100) stood at 136 for 1953, approximately 37 per cent. above the 1937 level.⁴ But at the same time there has been a decline in the exchange of primary commodities such as coal, and this of course is the trade that provides the sea borne bulk cargoes which are the mainstay of tramp shipping. Another factor of importance to shipping is that an increasing proportion of international trade is being conducted on a regional basis, for the tendency for trade to confine itself to adjacent countries, trade within Western Europe for example, diminishes the demand for shipping space.

¹John I. Jacobs and Co. Ltd., *Half-Yearly Review of the Tanker Market*, January-June, 1954.

²Mr. W. J. Elliot, President of the Shipbuilding Conference. *The Financial Times Annual Review of Industry*, p. 21, June, 1954.

³Of the 3,886,120 gross tons under construction and preparing in the United Kingdom on the 30th June, 1954, tankers and liners accounted for 3,387,556 gross tons.

⁴*Chamber of Shipping Annual Report, 1953-54*, p. 144.

At the same time there has been a steady increase in world tonnage. On the 31st December, 1953, the tonnage of vessels of 100 gross tons and over amounted to 90.9 mn. gross tons, and of this 18 mn. gross tons, representing 19.9 per cent. of the world total, was registered in the United Kingdom.¹ The tonnage of ocean going ships, that is vessels of 500 gross tons and over, increased from 61.4 mn. to 86 mn. gross tons between 1939 and 1953.² A good deal of the increase was due to the increase of 90 per cent. in tanker tonnage from 11½ mn. to 22 mn. gross tons in the same period, and the dry cargo fleet of 64 mn. gross tons included the 14 mn. gross tons laid up in the United States reserve fleet.

In the immediate post-war period there was an abnormal movement of supplies for the relief and rehabilitation of war devastated areas, and for the support of occupying forces in former enemy countries. This movement, which involved to a very large extent the shipping of bulk cargoes, made heavy demands on shipping space but by 1949 the position had eased considerably and freights were falling. War in Korea created boom conditions in the freight market, and the Chamber of Shipping Index of deep sea tramp freight rates (1948 = 100) rose steeply to a peak of 190 in October, 1951. But they fell again just as rapidly in the first half of 1952, and although there was a slight improvement towards the end of the year it was not maintained. During 1953 they were back almost to the level of 1949.

The low level of freights (the average for the first six months of 1954 was 84.3) and the amount of tonnage laid up³ suggest that the supply of transport capacity is outstripping the demand for shipping space, and that there is sufficient tonnage already in existence to meet the needs of normal trading. Disregarding for the moment defence considerations, this means that the demand for new ships will be reduced to the replacement of obsolete vessels, and marine losses. Assuming a life of 25 years and an even age distribution, regular replacements for a fleet of 90 mn. gross tons would require annual

¹*Chamber of Shipping Annual Report, 1953-54.* Table 3, p. 148.

²*Chamber of Shipping Annual Report, 1953-54,* p. 140.

³On 1st July, 1954, 205,173 gross tons of British shipping were laid up for reasons other than repair.

deliveries of 3,600,000 gross tons. Unfortunately the age distribution of the existing fleet has been completely upset by the abnormal replacement demands after the war and the almost complete cessation of building in the early thirties. But in any case, past experience suggests that a replacement figure based on an average life of 25 years is probably too high. The combined figure for marine losses and tonnage broken up, as a percentage of the tonnage afloat in the period 1920-38 averaged 2.01 per cent. for the world as a whole, and 1.88 per cent. for the United Kingdom. Improved navigational aids will probably reduce the incidence of marine losses below the pre-war figure, but technical progress, particularly in marine engineering, is likely to increase the rate of scrapping. Taking these factors into account a reasonable estimate is an annual replacement demand of $2\frac{1}{2}$ per cent. which would require an output of 2,250,000 gross tons per annum to maintain a fleet of 90 mn. gross tons. How much of this tonnage will be built in the shipyards of the United Kingdom?

II

British shipowners do not as a rule place contracts abroad and we can assume that replacements for the United Kingdom fleet will be built in this country. With a fleet of 18 mn. gross tons a replacement demand of $2\frac{1}{2}$ per cent. will call for the construction of 450,000 gross tons per annum, and it is vitally important for the shipbuilding industry that British shipping maintains its absolute if not its relative position in world shipping. Measures designed to protect national maritime interests—operating subsidies, grants in aid, favourable loan provisions—have already been introduced in most countries, and flag discriminations, particularly the allocation of cargo according to what has become known as the American 50/50 rule,¹ is widespread. Shipping has come to be regarded as a “key” industry both in the commercial and military sphere, and it is therefore held to be good public policy

¹The principle that a nation should carry at least half her cargoes in her own ships had been widely advocated before the war, but was first introduced in shipping Marshall Aid cargoes from the United States. This was seized upon by other nations as a precedent for introducing similar conditions into ordinary commercial agreements.

to promote the growth of a national fleet through a system of state subsidies¹ and restrictive clauses in commercial treaties. To succeed in the face of this type of competition, it is essential that shipowners should have at their disposal an efficient and up-to-date merchant fleet.

TABLE II *
STEAM AND MOTOR VESSELS OWNED AND REGISTERED IN
THE UNITED KINGDOM, 30th JUNE, 1953
BY TYPE AND AGE

Gross Tons (000)						
Age	Foreign Going Vessels			Coasting and Home Trade Vessels		
Group	Liners	Tramps	Tankers	Liners	Tramps	Tankers
Under 5 years ...	1,713	395	1,366	69	143	4
5 and under 10 ...	2,476	621	1,265	97	116	20
10 and under 15 ...	1,639	1,085	607	23	100	13
15 and under 20 ...	897	139	258	74	72	8
20 and under 25 ...	565	88	185	60	47	2
25 years and over ...	1,138	177	243	116	184	16
TOTAL ...	8,428	2,505	3,924	439	662	63
Average age in years	12.12	10.92	8.76	17.11	16.28	15.67

*Source : *Chamber of Shipping Annual Report*, 1953-54. Table 7 (a) and 7 (b), pp. 154-155.

¹American policy has been justified entirely on these grounds "... a modern efficient merchant fleet and an effective and progressive shipbuilding industry are necessary economic adjuncts to the peace time economy of the United States ... and they ... are indispensable to national security and would have to be maintained even if there were no other benefits occurring." *Report of the President's Advisory Committee on the Merchant Marine*, p. 2. Washington, 1947.

Numerically, the fleet has been restored to its pre-war strength, and the average age of foreign going tonnage is just over 10 years, though in the coasting and home trade it is considerably higher. The liner companies have now reached a stage when nearly all their fleets have been built since 1944, and of the deep sea tramps tonnage less than one-fifth is over 15 years of age, but on the other hand, more than half the remaining tonnage was built in the period 1940-44. This war built tonnage, is already proving expensive to run, and within a few years will prove impossible to operate competitively. Thus a large block of tramp tonnage requires to be replaced in the near future. In addition approximately one-quarter of the coasting and home trade fleet is over 25 years of age, and in all, nearly 3 mn. gross tons of United Kingdom shipping is now over 20 years old and due for replacement. The industry committed itself to a very heavy programme of capital expenditure to replace its war-time losses¹ and the future replacement of obsolete tonnage will be determined by the level of shipbuilding costs and the shipowners ability to finance new construction.

Shipbuilding costs have risen steeply since 1939, and especially since 1945. How great the increase in cost has been is illustrated by the index of building prices, of a plain deep sea tramp ship.

TABLE III *

INDEX OF BUILDING PRICES 1938 = 100*			
1938 =	100	1949 =	260
1941 =	123	1951 =	284
1943 =	154	1952 =	353
1945 =	169	1953 =	370
1947 =	216		

*Source: *Liverpool Steamship Owners' Association. Annual Report, 1953, p. 26.*

The rise in the case of liner tonnage, particularly specialised liner tonnage, is known to have been more marked. The increase of 8/6 per week for skilled men with a corresponding increase for other grades which came into force in April, followed by an increase of 15/- per ton in ship plates in June has meant a further increase in prices during 1954; but not only are ships three or four times more costly than in the years immediately preceding the war; they also take very much longer to build.

¹M. G. Kendall: *Economica*, New Series, 1948, Vol. 15, pp. 292-3.

Recently, improved supplies of steel and a more even flow of materials into the shipyards has resulted in a higher rate of production, nevertheless shipbuilders are still reluctant to quote fixed prices.

The task of maintaining the efficiency of the merchant fleet in the face of rising costs is made more difficult by heavy taxation, but on the other hand, with the passage of time financing new construction out of depreciation funds is made less difficult since the proportion of ships depreciating at pre-war costs is falling all the time. The "investment allowance" has been welcomed by the shipping industry, but in existing conditions it is unlikely to stimulate a burst of new orders. New liners are still being delivered and there is a considerable amount of liner tonnage under construction for British owners, and no big replacement programmes are likely in the near future."¹ Nor can much be expected in the way of new tanker orders. There has been a marked falling off in the demand for tankers while at the same time new tonnage is coming into service at an increasing rate. On the 30th June, 1954, the world's tanker fleet amounted to over 38 mn. tons d.w.—an increase of over 2 mn. since January. Tanker freight rates have fallen to levels at which "it would hardly have been believed that owners could be willing to keep ships running, certainly, no proper allowance can be made for depreciation, etc. . . ." ² Tankers are already being laid up, and there has been an increase in the rate of scrapping of obsolete tonnage. 750,000 tons were scrapped during 1953, but with the large amount of tonnage on order, most of it for delivery within the next three years,³ unless there is an unexpected increase in the world demand for oil

¹A statement by Sir George Christopher, Chairman, Union Castle Steamship Co. Ltd., on new building reflects the attitude of most liner companies. "A year ago I said . . . that for the time being a halt must be called to further shipbuilding programme . . . the self denying ordinance announced last year must continue until costs or freight or both change. On neither of these scores is there any more justification for embarking upon a shipbuilding commitment now than there was then." *Annual General Meeting*, 27th May, 1954.

²John I. Jacobs and Co. Ltd. Half-Yearly Report, 30th June, 1954.

³It has been estimated by the Statistical Research Division of the Sun Oil Company, that excluding all vessels which will be over 25 years old in 1958, at the end of that year when the current building programme will be completed, the carrying capacity of the world's tanker fleet will be 32.2 per cent. greater than it was in January, 1954.

there is no likelihood of a shortage of tankers for some time to come. Very few tankers were ordered in 1953, and for the first six months of 1954, new orders placed throughout the world were down to 350,000 tons d.w. while cancellations amounted to about 39 vessels of 870,000 tons d.w.¹ This decline in tanker orders is disquieting, for tanker building—accounting for over 50 per cent. of the tonnage under construction each quarter since 1947—has made a substantial contribution to the post-war prosperity of British shipbuilding.

As for tramp shipbuilding, it is extremely doubtful if the initial allowance will prove to be sufficient incentive to the shipowner to build tonnage on a falling freight market, for there is no evidence to show that they place contracts in anticipation of an increase in the demand for shipping space. Generally, the upward movement in freights has already gone some way before contracts for new ships are placed, and as the existing fleet approaches the point of full employment, orders increase, with the result that the peak in the demand for new tonnage frequently coincides with the peak in freight rates. This was particularly true for example of the years 1937 and 1951. This placing of orders during the "boom" has generally been too late, for the lag between ordering and final delivery prevents the major portion of the ships from securing the advantage of the high rates, as indeed happened in the course of the last two years. The tonnage of tramp shipping on the United Kingdom Register declined from 3.4 mn. gross tons in 1939, to 2.4 mn. gross tons in 1952, and although the trend was reversed during 1953 it would be a mistake to regard the slightly improved figure of 2.5 mn. gross tons as marking a revival in tramp shipbuilding. A fast modern diesel tramp costs upwards of £600,000² at to-day's prices and, if ordered now she is unlikely to be delivered in less than twelve months, the uncertainty regarding the final cost is enough to deter tramp owners from placing contracts for new ships.

¹Tanker tonnage on order or building fell between January and June, 1954, by nearly 2 mn. tons to 9,604,950 tons. This was the sharpest drop since the war, and the total compares with a peak figure for tonnage on order or building of 14,542,000 tons d.w. at the beginning of 1953. Davies and Newman Ltd., Shipbrokers, *Half-Yearly Report*.

²*Fairplay*. Mid-Yearly Issue, 1st July, 1954, p. 46.

With high and unstable building costs, low freights, coupled with the comparatively low average age of the United Kingdom fleet, particularly of the tanker tonnage, it is possible that orders from British owners will fall short of the average replacement demand of 450,000 gross tons in the next few years. On the other hand, there are no reasons for believing that this figure will be exceeded until such time as the major part of the war replacement tonnage is due to be renewed in ten or fifteen years time.

III

Deducting the 450,000 gross tons required for the replacement of the United Kingdom fleet, leaves an annual replacement demand of 1,800,000 for the rest of the world, and the proportion of this tonnage that will be built in this country will be determined to a very large extent by comparative costs, and the ability of the shipyards to produce ships at competitive prices. Unfortunately the difficulty of distinguishing between various types of vessels, between naval and mercantile building, between repair work and new construction renders impossible a detailed international comparison of shipbuilding costs. We must therefore, consider those factors most likely to influence the future level of costs, and these cannot be properly understood without some reference to the changes that occurred in the distribution of world shipbuilding output during the inter-war years. On the eve of World War I the tonnage launched from British yards was greater than for the rest of the world together, and in the construction of ocean going vessels her supremacy was unquestioned. But the shipbuilding industry was already being built up abroad to a certain extent. By 1914 Germany, once a good market for British ships, was supplying the needs of her own nationals, and her competition was being felt elsewhere. Italian output was increasing, and both Holland and Japan were exporting ships. Competition in shipbuilding was already becoming keen and with the tremendous expansion in world capacity that occurred during and in the immediate post-war years, it was expected that the competition from foreign yards would be materially increased. After World War I there was a pronounced decline in the proportion of world

construction undertaken in British yards. Table IV shows that, with the exception of 1924, the proportion of the world's new ships launched in Britain never attained the pre-war level, and for most of the inter-war period launching represented considerably less than 50 per cent. of world output.

TABLE IV
WORLD AND UNITED KINGDOM OUTPUT
(Tonnage Launched)

Year	United Kingdom Output	U.K. % of World Output	U.K. Output intended for Registration Abroad	% of U.K. Output intended for Registration Abroad	World Output for other than British Owners *	U.K. Output for Registration Abroad as % of World Output for other than British Owners	World Output
1909-1913 (av.)	1,522,000	58.7	340,000	22.4	1,407,000	24.2	2,589,000
1920	2,056,000	35.1	846,000	41.2	4,652,000	18.2	5,862,000
1921	1,538,000	35.4	592,000	38.5	3,411,000	17.4	4,357,000
1922	1,051,000	41.7	268,000	26.0	1,702,000	15.7	2,467,000
1923	646,000	39.4	18,000	2.9	1,015,000	1.8	1,643,000
1924	1,440,000	64.0	221,000	15.3	1,029,000	21.5	2,248,000
1925	1,085,000	49.3	178,000	16.5	1,286,000	13.8	2,193,000
1926	640,000	38.3	90,000	14.1	1,125,000	8.0	1,675,000
1927	1,226,000	53.7	268,000	21.8	1,328,000	20.2	2,286,000
1928	1,446,000	53.7	292,000	20.2	1,545,000	18.9	2,699,000
1929	1,523,000	54.5	260,000	17.1	1,530,000	17.0	2,793,000
1930	1,479,000	51.2	651,000	44.0	2,061,000	31.6	2,889,000
1931	502,000	31.0	123,000	40.7	1,238,000	10.0	1,617,000
1932	188,000	25.8	59,000	31.2	598,000	9.9	727,000
1933	133,000	27.2	12,000	9.1	386,000	3.1	489,000
1934	460,000	47.5	47,000	10.2	554,000	8.5	967,000
1935	499,000	38.3	64,000	12.8	867,000	7.4	1,302,000
1936	858,000	40.4	93,000	10.9	1,353,000	6.9	2,118,000
1937	921,000	34.2	124,000	13.5	1,894,000	6.5	2,691,000
1938	1,050,000	34.0	204,000	19.8	2,188,000	9.3	3,034,000
1945	894,000	12.4	18,000	2.0	6,317,000	2.8	7,193,000
1946	1,121,000	53.0	115,000	10.3	1,109,000	10.4	2,115,000
1947	1,193,000	56.7	380,000	31.7	1,290,000	29.5	2,103,000
1948	1,176,000	50.9	410,000	34.9	1,544,000	26.6	2,310,000
1949	1,267,000	40.5	522,000	41.2	2,567,000	20.3	3,312,000
1950	1,325,000	37.9	441,000	33.3	2,609,000	16.9	3,493,000
1951	1,341,000	36.8	602,000	44.9	2,904,000	20.7	3,643,000
1952	1,303,000	29.6	415,000	31.8	3,508,000	11.8	4,396,000
1953	1,317,000	25.9	365,000	27.7	4,144,000	8.8	5,096,000

Source : *Lloyds Register Annual Summaries of the Mercantile Shipbuilding of the World.*

* Figures supplied by the Registrar General of Shipping and Seamen show that the tonnage built abroad annually for British Owners is small in relation to the total, and it has not been taken into account.

These changes in the pattern of world output were accompanied by changes in the proportion of British output that was intended for registration abroad, and by a decline in her proportion of world launchings for other than British owners. In 1909-1913, 22.4 per cent. was for registration abroad, in 1920-22 and again 1930-32 the percentage was greatly in excess of the pre-war average, but for most other years it was considerably less. Similar fluctuations occurred in the proportion of British launchings to world output for other than British owners, but apart from 1930 when the proportion reached a peak it remained well below the pre-war average of 24.0 per cent. This decline in shipbuilding exports was one of the most disquieting features of British shipbuilding activity between the wars. In the five years preceding World War I, Britain supplied just over one-quarter of the tonnage requirements of the world, excluding ships for British owners, in the corresponding period before World War II she built less than one-eighth of this tonnage.

The expansion of shipbuilding abroad in the period between the two wars took place very largely at the expense of the British industry. It cannot be said that any one country was our chief competitor, but it appears that one or other of the continental countries was always more favourably placed than Britain for building and repairing ships. Contemporary opinion was prone to blame the unhappy position of the industry on circumstances outside its control, especially on World War I and the expansion of capacity both at home and abroad which increased the world's merchant shipbuilding capacity to 10 mn. gross tons. The growth of subsidies, extended credits, political influences, currency instability and exchange control, were a serious handicap to British firms, but the absence of foreign work cannot be wholly explained in terms of barter agreements and an overvalued pound. Lower continental labour and material costs, new developments in marine engineering, particularly the diesel engine, which our competitors were quick to exploit, and new techniques and improvements in ship construction all played their part. But the fundamental weakness was the individualism of the shipbuilder, for it impeded, and delayed, the structural, financial and technical reorganisation

that became necessary to enable the industry to maintain its position in a changing world.

During the past ten years, British shipbuilders have made extensive structural changes, and there have been important advances in the technique of, and in the materials used for shipbuilding. The re-equipment of shipyards to take advantage of modern methods, the increasing use of machine tools, hydraulic and electric power, have undoubtedly improved the technical efficiency of the industry, but the most important advance has been the extension of welding to major structural units in ship construction. Since 1939, the industry has changed over very largely from a riveting technique to the extensive use of welding, pre-assembly and pre-fabrication methods. Moreover, the policy of expanding output capacity by increasing the number of berths in existing yards and establishing new yards, pursued with such disastrous consequences in the years 1917-20 was not repeated; efforts were concentrated on re-equipping and redesigning existing yards.¹ There have also been notable developments in the field of marine engineering, particularly in the production of a marine gas turbine.² A great deal of experimental work has been done on the marine use of the gas turbine, and technical progress has gradually reduced operating costs to the level at which it begins to be a practical proposition for merchant ships. There has also been a steady increase in the average size of ships and with increased size a geared steam turbine has a decided advantage over the Diesel engine. This is a factor of considerable importance, for British marine engineers continue to lead the world in the development and production of turbine machinery.

¹*E.g.* At the Vickers Armstrong Naval Yard, Walker-on-Tyne, a reconstruction scheme, and redesigning of the yard layout to derive maximum advantage from modern technique of hull prefabrication and welding was completed in 1950 at a cost of £1½ mn. (*The Times*, 11th April, 1953). In the five years 1948-53, expenditure by Swan, Hunter and Wigham Richardson Ltd., on re-equipment and reconstruction of their shipyards and marine engine works exceeded £2 mn.

²The first major experiment with gas turbine propulsion in a merchant ship was made in Britain in 1952, when one of the four Diesel alternators of the tanker *Auris* was replaced by a gas turbine alternator. Sea trials were successful and as a result the first order for a seagoing tanker propelled solely by gas turbine was placed by the Shell group during 1953.

Technically the industry is in a much stronger position to meet the competition of Continental producers than it was in the thirties, and in addition the shipbuilder has enjoyed and continues to enjoy the advantage of cheap steel.

INTERNATIONAL HOME
TRADE PRICES¹
(Per Ton)

Country	Angles	Plates
United Kingdom ...	£28 12 0	£32 9 0
U.S.A.	38 16 0	38 16 0
France *	36 18 0	42 3 6
Belgium *	35 4 6	42 1 0
Germany	38 18 6	45 14 0

* Basic Bessemer quality. The price of open Hearth quality which is normally used for shipbuilding is approximately £3 dearer in France and £5 in Belgium.

This is a tremendous advantage, and it has been suggested that the fears of foreign competition have been greatly exaggerated, because few competitors can approach the British industry in efficiency, and none have the advantage of cheap steel.² But even if it could be assumed that the industry would continue to enjoy these advantages in the future, there is no reason to suppose that, of themselves, they would be sufficient to attract a steady flow of export work to British yards.

The financial accommodation—the amount of credit and the period over which it is granted—which the shipbuilder can offer the shipowner has played, and continues to play, an important role in the competition for shipbuilding orders. In the immediate post-war years, accumulated sterling balances secured many contracts for British shipyards, but as these were worked off, exchange difficulties and the stringent conditions imposed by the Capital Issues Committee on loans for ship construction, made it increasingly difficult for the shipbuilder to offer attractive financial terms to foreign owners. The ability to provide long term credit is often sufficient to secure a contract, and until recently the British builder was at a decided

¹British Iron and Steel Federation, *Monthly Statistical Bulletin*, Volume 28, No. 6, June, 1953.

²See statement of Mr. J. E. Hill, Secretary of the Boilermakers' Society at the Court of Inquiry into Wages. Reported in *The Times*, 15th January, 1954.

disadvantage in this respect. But the banks are now free to negotiate medium term loans for ship construction on their own terms¹ and this, coupled with the facilities provided by the Ship Mortgage Finance Co. Ltd. very largely solves the problem of financing shipbuilding contracts placed by foreign owners. In addition the Export Credit Guarantees Department's Special Guarantees referred to by the Chancellor in his Budget speech, should also make it easier to finance contracts from abroad.

On the other hand, direct subsidies to shipbuilding have become a prominent feature of the assistance afforded by foreign countries in support of their maritime industries. Construction subsidies were resumed in the United States as early as 1947.² In France lump sum payments are made to shipbuilders to compensate for the difference between their costs and those of their competitors.³ Attempts are being made to foster shipbuilding in Australia, and the Indian Government has accepted the principle that the price to be paid for ships built in India should be equal to the cost of building a similar vessel in the United Kingdom, the difference between the price and the actual cost of construction to be paid as a subsidy by the Government.⁴ Financial assistance to shipbuilding is a feature of German and Japanese maritime policy.⁵ The West German Government was responsible for the allocation of counterpart funds arising from American aid, and it decided how the funds canalized through the Reconstruction Loan Corporation should be used.⁶ Municipal loans have also been

¹*Hansard*, 17th December, 1953, Col. 93.

²Estimates for the support of U.S. Mercantile Marine in the fiscal year ending June, 1953, amounted to \$211,343,000, of which \$50 mn. was for direct operating subsidies, and \$140 mn. for ship construction. Operating and constructional subsidies are provided to maintain services on essential routes, while abnormal requirements arising out of the "present emergency" such as the building of a fleet of 35 fast cargo ships by the Department of Commerce were being dealt with in temporary new programmes. Expenditure for this programme was expected to amount to \$144 mn. in 1953. *The Times*, 10th March, 1953.

³*Shipping World*, 16th December, 1953.

⁴*Ibid.*, 30th December, 1953.

⁵*Chamber of Shipping Annual Report. The Times*, 22nd February, 1954.

⁶In June, 1953, plans for the reconstruction of certain yards in the Weser area were announced in Bonn. The A. G. Weser, Bremen was to receive a rehabilitation credit of M3 mn. and the sum of M½ mn. from a fund for providing additional employment. *Shipping World*, 10th June, 1954.

made to rehabilitate shipyards.¹ Since the currency reform of 1948 and the relaxation of controls a year later, there has been rapid investment in the industry, and it has also benefited from the substantial income tax and depreciation concessions to encourage investment. In Japan all shipbuilding is officially controlled under a system of indirect subsidies. These include a subsidy on imported iron and steel ; a reduction on the rate of interest charged on loans to shipbuilders ; and a complicated system of relief through reduced corporation tax and insurance rates.²

Both Germany and Japan are once again becoming as formidable a force in world shipbuilding as they were before the war, but ever since they reappeared as serious competitors, British shipbuilders have taken comfort from the fact that whatever might be said of delivery dates, they could always beat them on price. This advantage is likely to be lost in the near future. Continental yards which were either destroyed during the war, or dismantled subsequently, are being rebuilt and modernised. In Germany new heavy plate mills promise an ample supply of wide plate of high finish of a kind specially suited for the building of all welded ships, which shipbuilders on the Clyde claim they cannot get.³ Such developments and the increasing output of steel in Western Europe must lessen the present wide disparity between British and Continental steel prices.⁴ As to the other major element in shipbuilding costs, labour costs, the situation is very similar to that which held during most of the inter-war years. Abroad, the three shift system, which allows for much more intensive use of Capital equipment, is almost universal. The wage structure is extremely simple and piece work is general. Demarcation is not a problem, whereas in Britain, demarcation limits continue to be a constant source of minor disputes and their effect in raising costs is far

¹Hamburg Municipality placed sum of M1,150,000 at the disposal of the firm of Heinwerder Industrie A.G., to clear the yard of Blohm and Voss of war damage and prepare it for repairing ships. *Shipping World*, 28th January, 1953.

²*The Times*, 4th December, 1953.

³*The Times*, 18th February, 1954.

⁴A general reduction of £5 a ton in the export prices of British steel plates announced by the Iron and Steel Federation in February, 1954, reflects increasing competition and suggests that the supply of steel plates is already catching up with the demand.

from negligible.¹ A precise balance of competitive advantage cannot be struck, but there is a slight presumption that the Continental producer has the advantage in the matter of labour costs.

In the immediate post-war years, the view was frequently expressed that Continental producers and Japan would be so pre-occupied with the reconstruction of their national mercantile fleets, that they would not emerge as serious competitors for many years. It is now evident that such a view under-estimated the recuperative powers of the nations concerned, and especially the recovery of Germany and Japan. Their recovery has been remarkable. German output is 40% higher than pre-war, and in both Germany and Japan the target set for their national mercantile marine has been almost achieved. Prefabrication has made impressive strides, and the investment in fixed assets has been such that shipbuilders now find it difficult to find orders commensurate with their enlarged and still growing capacity. For the future there are two alternatives, either to continue to add to their ocean-going fleets, or to concentrate their surplus capacity on shipbuilding for export by quoting prices well below the level of total costs. Which of these two courses will be followed must depend, to a certain extent, on world demand for shipping, but the available evidence seems to suggest that the second is being favoured and that a "price war" is already developing. The German industry is already operating a "dual" pricing system, quoting low export prices at the expense of domestic consumers. Firms are quoting within twenty shillings per ton dead weight of present British prices, and in some cases, their prices have been well below the best British quotations.² In Japan excess capacity has proved a strong incentive to cut prices, and firms have accepted

¹In one shipyard, in the course of a year, senior officials had to attend over 100 meetings on demarcation issues between trades.

²During 1953, a Chilean firm called for tenders to construct four coastal vessels of 1,500 tons d.w. Average German tender was \$2,680,768, average British tender \$3,031,365. *Western Mail*, 2nd December, 1953. The tanker *Tina Onassis* of 45,000 tons d.w. was built by Howaldswerke Hamburg A.G., for roughly £51 per ton d.w. In Britain tankers of 32,000 d.w. were being built for approximately £65 per ton d.w. *Shipping World*, 13th January, 1954.

and still are accepting export orders at well below costs.¹ Other countries are also building on a large scale and offering strong competition. As old orders are worked off and competition becomes more keen, to ensure a steady flow of foreign work into British shipyards will demand a continuous drive for productive efficiency.

Since 1947 shipbuilding exports have been running at a high level, reaching a peak of just over 600,000 gross tons in 1951, but in the last two years, the proportion of world shipbuilding undertaken in British yards and the level of exports have been declining. Some decline in Britain's share of world output was to be expected with the rehabilitation of the industry in former occupied countries and the removal of restrictions on the shipbuilding activities of Germany and Japan. The decline in exports can be explained partly by the fact that British shipbuilders with full order books can offer no prospect of early delivery. No doubt the earlier delivery which continental yards can offer is an important consideration, but it is becoming less so, and once again political and financial factors coupled with fixed, and very often lower prices,² are exerting their influence on the distribution of shipbuilding contracts. During 1952-3 the percentage of United Kingdom output to world output for other than British owners fell to an average of 10 per cent. (see Table IV).

IV

We have already seen that the average replacement demand for the United Kingdom fleet may be in the region of 450,000 gross tons per annum. If we assume that the United Kingdom share of the replacement demand for the rest of the world will be 10 per cent. (approximately 200,000 gross tons),³

¹Prices up to \$10 per ton d.w. below British prices were being quoted for export tankers. *Shipping World*, 2nd September, 1953.

²Orders for four large oil tankers worth £7½ mn. which had been given to two well-known British shipyards have been cancelled. The orders are now expected to be placed with Continental yards which have offered earlier delivery and cheaper prices. *The Times*, 3rd December, 1954.

³The average of the period 1920-38 was 12.9 per cent.—approximately 250,000 gross tons.

this gives a total average demand of something like 650,000 gross tons per annum, 100,000 gross tons less than the average for the period 1934-38. A related and equally important problem concerns the regularity of the demand over time. Shipbuilding has been subject to violent fluctuations in output which were even more damaging than a low level of activity. Prolonged periods of under employment interspersed with short bursts of feverish activity retard development, and it has long been recognised that if the industry is to function satisfactorily some method of securing a more even flow of work must be devised. New construction, particularly of tramp ships, is determined by conditions in the freight market, and the fluctuations in freight rates are transmitted to, and amplified in the shipbuilding industry through variations in the level of new construction. One cause of the extreme fluctuations in freights lies in the international character of the market, and the difficulty of controlling it effectively. So far, no satisfactory method of control has been devised, and the problem of mitigating the fluctuations in freights remains.

One feature of shipbuilding demand which shipbuilders persistently drew attention to was the "unsatisfactory" timing of Admiralty contracts "... the figures from the early 1930's to the late 1930's show that naval orders were so timed that when the volume of merchant shipbuilding improved so did that of naval building, and when the former declined, or indeed fell nearly to zero, so did the latter. From the point of view of steady employment, the placing of naval orders could hardly have been arranged in a more unsatisfactory way..."¹ Between 1927 and 1937 expenditure on new construction in private yards varied between £6 mn. and £23½ mn., and the displacement tonnage launched between 870 and 97,600.

Assuming that it had been possible to vary naval launchings inversely with merchant ship launchings, which also reached its lowest point in 1933, by allocating the expenditure incurred on contract-built ships in the years 1934-6 to the period 1930-32, it would have been of considerable value to the shipbuilding industry. But it must be realised that naval

¹Mr. A. M. Murray, Presidential address to the Institute of Engineers and Shipbuilding in Scotland, 3rd October, 1944.

TABLE V
APPROXIMATE DISPLACEMENT TONNAGE LAUNCHED,
1927-37

Year	Total	Clyde	N.E. Coast	Barrow and Liverpool	Other Districts
1927	1,054	1,054	—	—	—
8	75,430	21,540	20,290	33,620	—
9	20,220	6,860	4,180	9,180	—
30	20,039	2,660	10,060	5,989	1,330
1	4,140	—	—	2,750	1,390
2	21,305	2,750	2,750	13,055	2,750
3	875	875	—	—	—
4	61,960	25,635	13,690	17,305	4,330
5	21,440	8,895	—	4,190	8,365
6	66,149	31,080	26,060	5,448	3,721
7	97,649	42,970	23,465	23,635	7,579

construction could have done little to relieve the plight of the industry in the depths of the depression. Capacity was somewhere in the region of 3 million tons, and assuming that one displacement ton is equivalent to two gross tons, the addition of 100,000 tons of warship work could have made very little difference to the situation in the shipyards. It is also very significant that the enormous expansion of warship construction in the period 1937-39 did not compensate for the decline in merchant ship construction during 1938 and the early months of 1939.

Presenting the Navy Estimates to the House of Commons in 1946, the First Lord of the Admiralty revealed that on the recommendation of the Ministry of War Transport and Ministry of Labour, the Government had decided to set up a Shipbuilding Advisory Committee with a larger and more representative membership, and with wider terms of reference than the Government Committee responsible for licensing building during the war, "to advise the Government on all matters affecting the stability of the industry . . . and on steps required to safeguard the war potential of the industry." This was followed by a further statement in 1950 ¹ to the effect that the Admiralty was closely concerned in the maintenance level of employment in the shipbuilding and ship-repairing industries, and as the merchant fleet has been restored to the pre-war

¹Cmd. 7879, 1950.

tonnage and the arrears of repair-work largely overtaken, a comprehensive investigation was being made into the problem. These statements suggest that some attempt will be made to 'plan' naval construction in future, but warship building is dictated very largely by political and strategic factors which no amount of planning can overcome. Moreover, in relation to the total number of yards, very few are capable of undertaking naval work, and even if warship construction can be geared to mercantile work its value will be restricted to a few yards in two or three of the major shipbuilding districts.

Shipbuilding capacity has been estimated to be in the region of 3 mn. gross tons per annum,¹ which, even when allowances are made for fluctuations in demand, is greatly in excess of future commercial requirements. So once again, the industry is faced with a serious problem of excess capacity. Some of the larger shipbuilding firms have taken steps to diversify their products, but the provision of alternative employment within the industry is obviously limited and must necessarily be confined to the engineering rather than the shipbuilding activities of these firms. It is difficult to see, even if we take the most optimistic view of future demand, how the present capacity can be maintained in production, nor how the labour force attached to the industry can be fully employed beyond the next two or three years.

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¹Sir Amos Ayre, James Watt Lecture, 1947. *Greenock Philosophical Society, Trans. Reprint*, p. 12.

Normative Factors in the Supply of Labour

I. INTRODUCTION.

This paper proposes to compare the labour turnover of some grammar school teachers with that of factory workers.

Up to the present research into labour turnover has been confined almost exclusively to industry. It has revealed that the incidence of factory labour turnover differs for different groups of workers according to their sex, age, length of service, and occupation, and according to employment opportunities.¹ In English factories labour turnover is usually higher for women than for men ; it tends to decrease with age, at least after the age of thirty ; it decreases steadily with length of service, and is highest among newcomers and lowest among long service workers. It differs for different occupations, and is lower for skilled than for unskilled workers. Furthermore, labour turnover varies with the number of vacancies in the labour market. In a densely populated area with many factories it tends to be high and in sparsely populated areas with only a few isolated plants low. Labour turnover shows an inverse relationship with the level of employment, being high under full employment and low during periods of unemployment. It should be noted that research has been unable to establish the existence of a relationship between wages and labour turnover.

The differential incidence of labour turnover cannot easily be accounted for by the usual type of economic analysis. Traditional economic theory moves on too high a level of generalisation to be a useful tool for explaining these

¹Compare for instance :

Florence, P. Sargent, *Economics of Fatigue and Unrest* (London : Allen and Unwin, 1924) and *Labour* (London : Hutchinson's University Library, No. 25, 1949). Long, J. R., *Labour Turnover under Full Employment*, Monograph A2, University of Birmingham, Studies in Economics and Society, 1951. Cook, P. H., "Labour Turnover Research," *J. Inst. Personnel Management*, 33, 2 (1951). Baldamus, W., "Type of Work and Motivation," *Brit. J. of Sociology*, 2, No. 1 (1951). Greystoke, J. R., Thomason, C. F. and Murphy, T. J., "Labour Turnover Surveys," *J. Inst. Personnel Management*, 34, 158 (1952). Behrend, H., "Absence and Labour Turnover in a Changing Economic Climate," *Occupational Psychology*, 27, No. 2 (1953).

phenomena. Thus although it is possible to apply to the industrial worker's behaviour the indifference curve technique, showing that in whatever he does he prefers the larger to the smaller advantage, this is merely description, not explanation. If we move a step downward on the level of abstraction, we arrive at what is left of Alfred Marshall's concept of psychological "net advantages," and this, as we shall see, has still some usefulness. Recently, however, a number of writers have suggested a move towards a distinctly different type of orientation in economics, namely towards explaining economic behaviour in terms of many interacting motives instead of one overriding single motive such as the maximisation of satisfaction or of profits. Stress is laid on the restraining or compulsive influence of habits, conventions and aspirations.¹ But these factors are difficult to isolate. In an attempt to explore their significance for the supply of labour, it would seem promising to contrast industrial work with a radically different kind of occupation, representing a completely different cultural environment. The professions appear to fulfil such a criterion, and for that reason I have selected teachers for a comparative study of labour turnover.

The study is based on data for teachers in four boys' grammar schools and three girls' grammar schools. It compares

¹Katona, for instance (*Psychological Analysis of Economic Behaviour*, McGraw Hill Book Co., 1951) argues that greater attention should be paid by economists to the psychological basis of behaviour and distinguishes rational behaviour which is the basis of genuine decisions from habitual behaviour which is prompted by routine and not by reasoning. He speaks of motivational patterns and stresses that these are hardly ever ruled by one objective only, such as the producer's desire to maximise his profits, but usually involve a variety of factors and suggests that the important question for investigation is "whether under certain conditions some of the motives become prevalent while others fade away." (p. 204). Duesenberry (*Income, Saving, and the Theory of Consumer Behaviour*, Harvard University Press, 1949) discusses the influence of learning and habit formation on consumption habits, and also stresses the conflict between this and rational planning. He emphasises the influence of the culture to which an individual belongs and argues that the goals of the society in which he lives become instilled in every individual's mind and affect his actions. Individual choices and preferences are not independent but are inter-dependent and often culturally conditioned. Boulding (*The Organisational Revolution*, Harper Bros., 1953) raises the question to what extent ethical ideas and value standards are critical variables in economic and social development. (Preface p. xxvi).

these data with figures for manual workers in Midland factories.¹ The information for the teachers was supplemented by case studies.

The comparisons refer to the years 1947 to 1952. This means that they refer to a period of full employment in industry and shortage of staff in grammar schools with many job opportunities for both manual workers and teachers, provided the latter were prepared to move to a different district or to a different occupation.

When comparing the data for workers and teachers differences in the structure of the labour market for the two types of occupation must be kept in mind, particularly differences in the location of vacancies and in the type of work contract.

The industrial worker can sell his services in a local labour market, while the grammar school teacher is forced to seek employment in a national labour market as only occasional grammar school vacancies are likely to exist in any given locality. A worker, thus, can change his job without changing his residence and a teacher cannot. For him the location of particular vacancies may be either a deterrent or an incentive to mobility.

As regards the work contract, the factory worker is normally employed on a weekly contract which can be terminated by either side. The teacher—after a probationary year—is on a four-monthly contract which can only be terminated by the employer in very exceptional circumstances, but can be terminated by the employee by a term's or half a term's notice. The worker thus has little security while the teacher has almost complete security of tenure which makes his work contract a one-sided bargain; he is free to choose whether he wishes to stay or not, and if he wants to move he can bide his time till something worthwhile turns up. On the other hand the four-monthly contract may prove a serious handicap to the teacher

¹The information for the teachers was made available to me through the courtesy of the schools and covered all full-time teachers, appointed to the permanent staff, who were employed by them in 1952 and who left them between 1933 and 1952. The figures for manual workers were collected under the direction of Professor Sargant Florence by a research team of the Faculty of Commerce and Social Science of the University of Birmingham.

when attractive vacancies arise at dates which clash with the terms of his contract, and may thus have an immobilising effect.

While remembering these differences in the structure of the labour market for workers and teachers, certain similarities in the market situation confronting both must not be overlooked.

Individuals do not necessarily need to seek employment in the same occupation as the one in which they are employed. The manual worker can choose his job among a fair range of occupations. The teacher, too, can take up work other than grammar school teaching. Many of the fears expressed in the reports on recruitment and staff wastage and in discussions on the 'inadequacy' of the Burnham scale express the belief that there is an exodus from the teaching profession and a movement to other jobs. Openings vary according to subject and are fewest for the arts graduate. Science graduates can find many different kinds of employment in industry and research. All teachers can apply for more remunerative jobs in educational administration and for headships of schools. They can turn to better paid forms of teaching in training colleges or technical colleges. Other careers can be entered by undergoing further training. Thus the teachers' opportunities to change to other occupations must not be underrated.

A choice between different occupations implies the possibility of a choice between jobs with different pecuniary returns. Given sufficient knowledge and versatility such a choice is open to both manual workers and teachers. In the case of workers, however, earnings (as distinct from wage-rates) may also vary for the same type of work in different factories. In grammar schools one salary scale, the Burnham scale, operates in the whole labour market with the exception of a few public schools, and a move from one school to another brings no financial advance unless it is linked to promotion.

II. SUMMARY OF STATISTICAL DATA.¹

In the years 1946-52 the schools employed together an average of 123 teachers. During this period 75 men left which amounts to an average annual turnover rate of 10·3%. The girls'

¹The detailed statistics and case studies cannot be included here for lack of space. The version given here is only a highly condensed abstract.

schools employed together an average of 87 teachers. During 1946-52, 80 women left which amounts to an average annual turnover rate of 15.7%. Details of the average turnover rates for the individual schools show that the turnover experience of the seven schools differed slightly, but that the range of variation was small compared with that shown by the factories. Turnover was highest for men in School 4 with a turnover rate of 12.8% and for women in School 7 with a turnover rate of 19.2%.

Figures for the Midland factories show that the average turnover rate for 37,000 male factory workers in 1948 was 33.6%, ranging in individual factories from 5% to 95%. For 15,600 women factory workers the average turnover rate in 1948 was 64.6%, ranging in individual factories from 17% to 133%. In 1952, when the turnover rates were considerably lower due to less full employment, the average turnover rate for 10,179 men was 24.7% and for 3,020 women 38.2%.

The average turnover rate for factory workers for both men and women was thus considerably higher than the average turnover rate for the teachers and even than the highest turnover rates experienced in individual schools, but there were a few factories with turnover rates which were as low as those in the schools. On the whole, however, the figures suggest that the turnover of grammar school teachers is far lower than that of factory workers.¹

Evidence with regard to the age of leavers did not reveal anything of special interest to this enquiry.

On the other hand, the evidence with regard to length of service revealed important differences between the behaviour of the teachers and workers. Only a small percentage of teachers was found to leave during the first year of service while the

¹It should be noted that the number of teachers in this study was small as compared with the number of workers. This fact highlights certain methodological difficulties which arise when turnover analysis is applied to small organisations employing between 20 and 50 persons. It was necessary to "lump together" leavers for the boys' and girls' schools respectively for a period of six years to eliminate chance fluctuations and to obtain enough cases for analysis. This limitation is probably not serious, especially as this is only a pilot study which aims to discover differences in behaviour which can give a lead for further investigation. The study does not claim to give generally valid statistical results.

majority of factory leavers stayed less than a year, as is shown by the following figures :

	Total number of leavers	Percentage of leavers with 1 to 12 months' service
Men teachers (1946-52) ...	75	9%
Male workers Firm B (1948) ...	4,797	83%
Male workers Firm D (1948) ...	645	61%
Women teachers (1946-52) ...	80	13%
Women workers Firm B (1948)	4,590	77%
Women workers Firm D (1948)	1,374	73%

The situation in the factory thus is quite different from that in the school. In the factory, the newcomer is the person most likely to leave ; this is not true of the school.

The meaning of differences in the length of service distribution of leavers becomes more apparent if we calculate the average length of service of leavers.

It was possible to calculate the average length of service of "voluntary" leavers from the schools and from Factory A3.¹ The results were as follows :

	Average length of service of 'voluntary' leavers
59 male teachers (1946-52) ...	5.9 years
468 male workers, factory A3 (1949)	1.0 year
76 women teachers (1946-52) ...	6.7 years
573 female workers, factory A3 (1949)	1 year 3 months

No similar figures could be calculated for the other factories. It was, however, possible to calculate fairly accurately the average length of service of the "problem half" of the leavers which was defined as the half with the shortest length of service. The leavers were, so to speak, ranked in order of length of service, and the half with the shorter lengths of service (*i.e.* below the median) were chosen for closer study. This revealed the following differences :

¹Voluntary leavers were defined as all people leaving for reasons other than retirement, death, military service and pregnancy.

	Average Length of Service of "Problem Half" of leavers
37 male teachers (1946-52)	30 months
2,537 male workers, Firm B (1947)	1½ "
2,399 male workers, Firm B (1948)	1½ "
657 male workers, Firm J (1947)	8 "
234 male workers, Factory A3 (1949)	1½ "
40 women teachers (1946-52)	25 months
2,019 female workers, Firm B (1947)	4 "
2,295 female workers, Firm B (1948)	5 "
447 full-time women workers, Firm J (1947)	7 "
171 part-time women workers, Firm J (1947)	5 "
237 women workers, Factory A3 (1949)	2 "

It can be seen that the average length of service of the teachers was $3\frac{1}{2}$ to 20 times that of the workers. It should also be noted that the average length of service of the teachers appears considerably longer than the time required for finding a different job, even for their type of work.

As regards the date of leaving, this must necessarily differ between teachers and workers because of the different work contract. As far as the teachers are concerned—if the legal obligation alone is operating—one would expect to find equal proportions of teachers leaving at the end of each term, given a sufficiently large sample. As the following data show, however, this was not the case.

	Proportion of teachers leaving at different dates (1946-52)			
	December	April	August	mid-term
74 men teachers	20%	18%	58%	3%
80 women teachers	11%	2%	87%	—

The majority of the teachers left in August, at the end of the teaching session. The proportion leaving in August varied for the individual schools; it was greater in the girls' schools than in the boys' schools, and in one girls' school (school 7) no member of staff left in mid-session between 1943 and the present day.

The teachers thus showed considerable restraint in the timing of their notice. The factory workers showed no such restraint. The data collected by us showed that in nearly all the factories workers left any time of the year, any day of the week, in spite of the weekly work contract. Often they came into the personnel office to demand their cards in the middle of the working day.

Evidence with regard to the choice of the new job was only available for the teachers. When a factory worker leaves, his employer does not usually know what job the worker is going to next, and the firms investigated had no information on this subject. Much of the evidence however suggests that many workers (probably the majority) leave their job without first obtaining other work. They do not appear to make a deliberate choice between two definite jobs comparing their prospective merits and demerits. In the case of the teachers the schools had records of the type of new appointment taken up, and of the names and addresses of the new employers, and there exists no doubt about the accuracy of the information. This information can be briefly summarized under five headings.

NATURE OF CHANGE OF EMPLOYMENT OF 140 TEACHERS

Direction of Change of Employment	Men		Women	
	Nos.	%	Nos.	%
1. Promotion in the teaching field	21	31%	10	14%
2. Change in the teaching field	20	30%	19	26%
3. Change to different type of work or training for it ...	8	13%	10	14%
4. Withdrawals from Labour Market				
(a) due to retirement and deaths ...	17	25%	9	12%
(b) due to marriage and pregnancy...	—	—	25	34%
5. Unknown	1	1%	—	—
Total	67	100%	73	100%

When analysing the changes of job, the most important feature with regard to the teachers' choice of a new job is that 60% of the men teachers and 50% of the women teachers leaving voluntarily moved to objectively better jobs while 40% of the men teachers and 50% of the women teachers moved to other grammar schools without any financial or occupational gain.

III. SUMMARY OF CASE STUDIES.

The statistical data by themselves do not permit a conclusive interpretation of all the differences in the turnover data of the teachers and factory workers. They were therefore supplemented by a number of case studies in order to obtain further insight into the behaviour and attitudes of the teachers. The case studies covered all the 26 women teachers who left school 7 between 1946 and 1952.

Eight of these teachers withdrew from the labour market. Two teachers reached retiring age and resigned. Three got married and set up home in a different district. One married teacher resigned because she was expecting a baby, another because she intended to start a family, and a third because she was "fed up." All eight resignations took effect at the end of the teaching session. This cannot be attributed to the structure of the labour market nor to the availability of jobs as all eight teachers withdrew from the labour market. The evidence shows that the timing of the withdrawals seems to have been adjusted to the convenience of the school and not to personal convenience. Two cases may be quoted to illustrate this point. Mrs. T. got engaged during the autumn term and handed in her resignation after Christmas to take effect in July. She got married in February but felt she must not leave in April and thus let down the children to suit her own convenience. Her husband worked in a different town which meant that she had to spend twelve hours travelling there and back if she wanted to see him for week-ends. Mrs. V. had one small child and joined the school in preference to being tied to the home, using her salary to pay for domestic help. But she discovered that teaching did not come up to expectation. During her second year she openly declared that she was fed up with teaching and with the school and was going to leave. She stressed that she was leaving

solely for this reason. One would expect that such a strong feeling of dislike would lead to immediate action in a case where financial or future job considerations can be disregarded. Contrary to this expectation, however, this teacher did not give the shortest possible notice once she decided to leave but informed the headmistress in January that she would leave in July although she would have been entitled legally to leave at the end of April.

Eighteen of the case-studies were concerned with changes of job. There was one change for promotion, and there were eleven changes of school involving no promotion. Six of these teachers resigned in order to get away from their present school surroundings into more stimulating or congenial ones. Five women moved to schools in a preferred location. Six teachers left grammar school teaching for different types of work which they considered more congenial.

All the case-studies had one factor in common : the teacher concerned moved to a preferred position, and—in the case of changes of job—only gave notice when she had secured a better post. It is interesting to note, however, that only two out of the eighteen changes of job involved financial gain and immediate occupational advancement. In ten cases the move did not affect the financial or occupational status. In six cases the move involved a reduction in income, and in some a temporary reduction in status where staff reverted to studentships.

The evidence revealed by the case-studies suggests that the behaviour of the eighteen teachers was purposive, and that the object which prompted the move was the hope of obtaining greater net advantages, represented by such factors as new interests, preferred location and preferred occupation. In each case the teacher tried to assess and weigh the advantages of the new job as compared with the old one and only resigned as the balance appeared in favour of the new job. The behaviour thus approximated to that of "economic man" who tries to obtain the most advantageous job within his reach.

Yet the desire of these teachers to move to a position which offered them greater satisfaction appeared to be kept in check by some other factors. The teachers who got married did not throw up their job at once but resigned for a date convenient

to the school—a fact which was in conflict with their immediate self-interest. The teachers who moved to other jobs did not apply for better jobs the moment they had joined the school. Generally there was a considerable interval between a teacher's arrival at the school and her first application for another job. This interval cannot be explained simply by lack of availability of subjectively better jobs. To begin with newcomers would usually not bother to watch whether better jobs were available because they felt that "they must stay some time before moving." Even when they were made aware of certain good job opportunities some of these teachers would not apply for the post, although it attracted them and corresponded to their preferences. One could often hear the remark in the staff-room of school 7: "What a pity, there is such a nice job advertised, but I can't apply for it." These observations seem to indicate that there exist strong restraining forces which conflict with the desire to move to a preferred position, and prevent excessive mobility in the teaching profession. Some of these restraining forces seem to lose their strength after a certain length of service. The effectiveness of the restraining forces also varied with individuals. Three of the four teachers who left the teaching profession, for instance, looked for another job almost immediately. Three of the younger staff who believed they would get married left after one year's service while ten leavers who intended to stay in the teaching profession stayed three years or longer before moving to a job which offered them greater net advantages.

In this connection the attitudes of headmistresses are also of importance. The headmistress of school 7 appeared to influence the timing of resignations. She expected her staff to stay to the end of the teaching session and from her arrival in 1943 to the present day no resignations occurred in mid-session at school 7. The headmistress encouraged newcomers to stay at least three years. She would discuss their plans with staff who expressed a desire to leave and impress upon them the requirements of the children and the need for them not to have excessive changes of staff and she would stress the moral obligations of the staff to the school. Other heads of schools express expectations with regard to length of service during

the employment interview. Miss S., for instance, found at an interview that she was offered the job on the understanding that she would stay a minimum period of four years.

The nature of the restraining forces which have kept in check the desire of so many of these teachers to move to a better position calls for further investigation. As a tentative explanation I would say that the evidence suggests that there exists a widely accepted code of professional conduct with regard to behaviour in the labour market. This code prescribes certain norms¹ of behaviour which should be practised in the teaching profession, and which put duty before preference. It considers that unnecessary and excessive disruption of the continuity of instruction is unethical and that the interest of the children should always come first. Their success in examinations must not be jeopardised and no teacher should leave in mid-session or when a successor cannot be found. He owes the school a minimum period of service as excessive numbers of changes of staff are harmful to children. This code of conduct, which prescribes a minimum period of service and advocates a convention of staying to the end of the teaching session, acts as a restricting factor which checks mobility. The code seems to be impressed upon the individual by his whole environment both during and after his training,² and exercises a strong compulsion which makes it difficult not to conform. Often the code is so pervasive that the actions it prescribes are taken for granted and the idea of a different course of action does not arise.

¹The importance of normative orientations in the analysis of industrial action is discussed in great detail by Dr. W. Baldamus in a forthcoming publication. His study is probably the first attempt to introduce normative analysis to a theory of industrial relations. I am greatly indebted to Dr. Baldamus for criticisms and suggestions in discussing the interpretation of the data which form the basis of this article.

²The inculcation of this type of normative orientation may even go further back to the social and cultural environment in childhood. It appears likely that teachers coming from a middle-class, and especially a professional, background conform more readily with the prescribed code of conduct. Unfortunately this angle was not investigated in the present study. The majority of the leavers at school 7 appeared to have a middle-class background and only two admitted openly to a working-class home.

III. DISCUSSION AND CONCLUSIONS.

The present investigation has revealed four main differences between the behaviour of teachers and manual workers in the labour market.

1. The average turnover of the teachers was considerably lower than that of the factory workers.

2. The teachers planned their moves carefully while the workers did not. The teachers did not give in their notice until they had secured a new job (married women giving up their employment are, of course, a special case). Many workers seemed to resign first and then look for other employment. The teachers, it appears, were not prepared to be without a job and continued in their old job until the "right" type of vacancy appeared. Workers were prepared to be momentarily without a job if they knew there was full employment and plenty of jobs available. The teachers weighed the advantages and disadvantages of the prospective job against those of their present job and moved when, in their view, the balance was in favour of the new job, and when no restraining factors were operating. The workers, on the whole, did not make a deliberate choice between two jobs.

These findings do not contradict the economist's assumptions that individuals move in order to maximise their net advantages. The moves of both teachers and workers can be interpreted as being prompted by the desire to increase their net satisfactions or to decrease their net dissatisfactions. The different manner of attempts to realise this wish can be attributed to differences in their job horizons. The workers' attempts are limited by lack of knowledge which forces them to adopt a haphazard trial and error method and gives rise to high mobility.

3. The average length of service in the job differed significantly. The average length of service of the teachers leaving their job was $3\frac{1}{2}$ to 20 times that of the factory leavers.

4. The majority of the teachers chose a date for leaving which suited the needs of the school. The workers left at any time which suited themselves and did not consider the needs of the employer.

It may be argued that all these differences between the behaviour of the teachers and workers can be explained by the vast objective differences in the external conditions and in the content of the two jobs. In my view, however, differences in the structure of the labour market and in type of work are sufficient only to explain part of the differences, not all of them. Above all, they cannot account for the last-mentioned observation (point 4). This seems to me the most important one as it suggests the type of new research which is now needed.

As far as the workers are concerned, the above evidence does not appear to conflict with the economist's assumptions that under full employment the worker's mobility in the labour market depends on one main set of motives: the desire to increase his "net advantages" or alternatively to decrease his "net disadvantages." This desire operates freely under full employment and would explain the high mobility experienced in the post-war years. Only unemployment has been found to be an effective check to high labour turnover. The fact that this mobility does not redistribute man-power according to the needs of the economy as reflected by the existing wage-structure can be attributed partly to imperfect knowledge. There may be other reasons, but this study has not brought them to light.

As far as the teachers are concerned, however, the evidence shows that their mobility is moulded by two main, but conflicting, forces: the desire to obtain the most advantageous job, and the restraints imposed by the existence of a professional code of conduct which demands that the continuity of teaching must be preserved by teachers staying a minimum period of time and leaving only at the end of a teaching session. The solution of the conflict between these two opposing forces—the economic calculus and the social norms—depends on the individual, his particular environment, and the influence of length of service.

The whole problem is highly complex and needs considerable further study. Research is needed to discover the norms which motivate different occupational groups¹ and to study the relationship between these norms and overt behaviour.

¹The Faculty of Commerce and Social Science of the University of Birmingham is at present engaged in conducting such norm-surveys.

The present study is but a first, small-scale attempt. Its special advantage, however, should not be overlooked: Teaching is one of the few non-industrial occupations where turnover data can be obtained and thus an objective comparison with labour made, and consequently the study of the reactions of teachers is particularly suitable to show up the effect of professional norms on behaviour. The present enquiry has revealed that there were teachers who sacrificed their preferences to duty and delayed moving to a preferred position for the sake of the school they were working for. The study indicates that normative orientations, such as the teacher's professional code of conduct, represent strong coercive pressures which may stop—or at any rate limit—an individual's choice calculations in terms of preferences. Social norms seem to represent a powerful independent, constraining, regulating, determining force which limits people's response to market forces, and thus the effectiveness of the price-mechanism. This study shows clearly how (in the case of the teachers) professional and market behaviour interact: the teachers act by the economic calculus within, or up to, the limits set by their loyalty standards to the school.

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Land-Use, Location and Transport

I

There is at present much concern about land-use, about location and about transport. But these subjects are discussed as separate problems, with little attention to their fundamental inter-relation.

To the classical economists, their close bearing on each other was obvious, since they were concerned only with the use of land by agriculture, and Britain had a considerable reserve of land left, and the means of transport were still the slow and cumbersome ones which had existed for thousands of years. Thünen's *Isolierter Staat* (1826) was a kind of "model" showing agricultural land-use as a function of location and of transport facilities.

The coming of the railway, however, went to people's heads like wine. Only its advantages were seen: "speed annihilates space."

In the modern literature on location of industry, while transport has been treated as a major, if decreasingly important, location factor, the scarcity of land has been given scant consideration. Yet in a treatise published in 1894,¹ little known and even less acknowledged in this country, Charles H. Cooley saw land-use, location and transport in conspectus. He realised that transport, while it "greatly modifies and extends territorial relations . . . (does) not diminish their general significance." (p. 71). He saw the detrimental as well as the beneficial effects of the railway:

"Transport having rendered extreme concentration (in towns) possible, now turns around and by means of . . . urban travel endeavours to mitigate its evils . . . Urban transport . . . enables men to work in aggregates and yet to live in decent isolation." (p. 76).

"Decent isolation" was a pathetically accurate, if unconscious, prophecy of the problems bedevilling housing estates to-day.²

¹Charles H. Cooley, *The Theory of Transportation*. Publications of the American Economic Association, Vol. IX, No. 3.

²The issue of the divorce between dwelling-place and work-place was the subject of the present writer's book *The Journey to Work*, London, 1944.

Since Cooley's time, the motor vehicle, the electric grid and other innovations have again radically changed the situation : through modern transport, land-use and choice of location have come to clash. It is the purpose of this article to discuss this development.

II

In the various uses to which land is put, its several attributes are of different importance. In agriculture, the main emphasis is on space, coupled with fertility ; about two-thirds of the acreage of England and Wales is devoted to farming. For towns, the essential consideration is location ; the space they occupied was, up to our own day, a negligible fraction of the total land.

Until a century ago, there were separate categories of land, destined, because each was fittest for a particular purpose, for one given use. To-day, different purposes have come to compete for the same tracts. An area may be wanted for agriculture and for industry and for houses ; for a playing field and for an aerodrome and for a water reservoir and for a school. Thus, in contrast to the ever-increasing division of labour, land-use within a country has become less specific.

In the competition between several uses, it is as a rule agricultural land that has been alienated. But the present issue is a more general one than that between land-use for agriculture and for other purposes. While the amount of land is limited, the competing uses have greatly increased.

An examination of the procedure by which land is to-day being allocated to the various claimants is beyond the scope of this article ; yet it seems pertinent to deal shortly with the economic theory of the matter, *viz.* the allocative function of Ricardian rent.

In the last hundred years, the market for land has not generally been regulated by rent according to the *Principles*, for reasons which can be grouped under two broad heads : (1) the price mechanism works, but not in terms of Ricardo's theory ; (2) the price mechanism does not work because of Government policy or other influences.

(1) The industrialisation of this country, and the availability of cheap imports, reduced the importance of differential fertility of Britain's soil (the corner-stone of Ricardo's rent theory) and enhanced the importance of another attribute of land, namely that of being the base for manufacture and all other human activities. From the middle of the 19th century onward, land on the periphery of towns, as it became easily accessible by the railway, has been liable to fetch higher rents as building sites than as farmland, almost irrespective of its fertility.¹ As to old urban land, the most valuable sites had been near the town centre long before steam power put an extra premium on the concentration of factories and, in the absence of mass transport, of workers' dwellings. In an open market for urban land, high rents are paid for favourable location, not for fertility of soil.

It thus appears that the allocative function of rent came to conform to Thünen's doctrine—*The Isolated State* postulates uniformity of soil—rather than to Ricardo's theory.

(2) The slums, the shrinkage of open space and other vitiations of the towns deriving from a free market for land led to State interference with the price mechanism. The use of urban land was indeed the first matter to become, in 1909, the subject of a Planning Act. Since then, relying on the advances of modern transport, town and country planning legislation has increasingly replaced the price mechanism by public control of land-use. Some section headings from the 1947 Act may serve as illustrations: "Obligation to obtain permission to develop"; "Power for compulsory acquisition of land by Ministers, local authorities and statutory undertakers"; "Powers (of control) relating to authorised uses"; "Levy of development charges."

In addition to the deliberate breaking of the price mechanism, the free market for land has been incidentally disturbed by Government policies adopted, wholly or partly, for other purposes: rent restriction, housing subsidies, derating of industrial premises, special grants to the Development Areas, subvention of farming and of air transport have all weakened

¹Since level and well-drained land is wanted for building sites, aerodromes and playing fields, as well as for agriculture, less fertile and less costly land in the Highlands of Scotland, for example, would be unsuitable for an airfield, quite apart from the remoteness.

the role of rent in determining land-use. So have certain private agreements, *e.g.* those on resale price maintenance which prevent the individual customer being charged with the actual costs of providing goods at the place where he lives. Both intentionally and unintentionally, rent has thus been more and more divested of its allocative function; the demand by "claimants upon land" and by "competing land-uses" is not the same as "effective demand" in the economic sense.

The free market for land which resulted in miserable living conditions stands condemned. But, it is argued in the following pages, new disadvantages and dangers are entailed in the current planning policy, largely because transport is being used undiscerningly.

III

Movement, it has been said, is imposed on man through the expanse and immobility of land. In turn, transport has profound repercussions on land-use and on the location of man's activities. Transport connects existing settlements, gives rise to new settlements, obliterates settlement boundaries. On the whole, these effects represent successive historic stages, but in some respects the periods overlap, and latterly there has been a cumulation of the three types of effect.

The two modern means of land transport have contrasting influences on land-use and location: the railway, by and large, makes for concentration, the motor vehicle for scattering of settlement, because of the all-over accessibility it affords.

Since 1945, a notable change has taken place in the use made of the increasing accessibility. The inter-war housing estates relied on the mobility of persons, *viz.* on the inhabitants' travelling to work and school, to shops and cinemas, and so forth. The post-war policy of taking work to the workers and shops to the neighbourhoods has resort to the mobility of goods, in the form both of raw materials and of finished articles. Social services too are to be made available locally.

Current town and country planning employs accessibility in three ways:

1. Open Development which is no longer confined to residential areas ; building density is even lower than before the war.
2. Decentralisation of Industry—
 - (a) new factories are being steered to Development Areas and to individual towns with poor employment opportunities ;
 - (b) factories and people are decentralised together, the “overspill” of large cities to be “decanted” partly to New Towns, partly to small existing towns.
3. Enclosure (to use the term in a new sense) which aims at “localising people’s lives” by planning numerically small, self-contained, green-belted communities.

Open development, decentralisation, and enclosure are each antagonistic to spatial concentration ; the policy founded on these three notions can therefore be described as a policy of Dispersal.

IV

Because of the new freedom of choice for spatial arrangement, the study of land-use and location is no longer restricted to the observation of facts but includes examination of the use made by the new means. Is the way in which the land has been allocated to various claimants having beneficial results ? Has transport been applied to make the best use of accessibility in the interest of the nation ? What are the lessons to be learnt from the experience ?

1. BENEFICIAL EFFECTS OF DISPERSAL.

The salutary effects of open development, decentralisation and enclosure are so generally acknowledged that a short account of them will suffice here.

The advantages of low building density and of decentralising part of the population in communities of, at the most, 80,000 inhabitants consist in a redress of the evils attending urbanisation and industrialisation in the preceding hundred-and-fifty years. Urban congestion is abolished not only in the new-built areas on the periphery, but reduced also in the central parts of the towns. The private gardens on cottage

estates are enjoyed by many families settled there. For the individual firm, one-storey factories are cheaper to build, to run and to alter than higher buildings.

The Development Areas have benefited from the policy of decentralising industry ; workers, by having work brought to them, have been spared migration and thus the uprooting of family life ; the economic life of the Areas in general has been stimulated through the multiplier effect.

2. ADVERSE EFFECTS OF DISPERSAL.

The disadvantages of dispersal are less obvious. They fall into four groups : depletion of the stock of available land ; loss of time ; costs of transport ; and social and economic enfeeblement.

(a) Depletion of the Stock of Available Land

The scarcity of land, mainly around big towns, has been seriously aggravated through the increasing number of land claimants and through the lavish use of land for non-agricultural purposes.

The growth of the urban population and the even greater growth of the number of households means that extra acreage is required for housing and, with higher standards of living, for community buildings and open space ; the land claims of manufacture have grown with the increasing transfer of production from homes to factories,¹ with the making of ever larger machines and through the conveyor-belt system.

In addition, powerful new bidders for land have arisen, among them transport itself. Aerodromes have become rapacious land-eaters. The roads' potential voracity for land was recognised by Cooley :

"The principle of the shortest route would require roads from every point to every other, in other words, turning into roads the whole surface of the earth . . . A compromise must be made between (this principle) and the principle that calls for economy of labour and space."²

¹Obversely, the tenement house with its overcrowding came into being only when men no longer worked a loom, etc., at home.

²*loc. cit.*, p. 14.

The vast growth of the number of motor vehicles calls for greatly increased space for motion and also for parking; buffer-space is required between traffic routes and the adjacent land for safeguarding against mechanical traffic.

These various demands together would by themselves have drawn heavily on Britain's stock of land, so that the need for husbanding this limited resource would have appeared to be obvious. But the finiteness of the quantity of land has been ignored and another type of new demand has been allowed to burst forth, *viz.* the demand for more land per non-agricultural user. Desire by, and for, everyone to enjoy private spaciousness, apparently met by cheapness of land at the periphery of the towns and by the development of modern transport, has led to low building density for all and sundry. Not only cottage estates and bungalows, but also one or two-storey schools, factories, garages, shops and hospitals—erected without serious examination whether a multi-storey building would not meet the purpose—all occupy more land than would be required in compact layout. Further, open development entails long, land-eating roads and paths to connect the wide-spaced buildings.

Information on the area covered by roads is not available—in new housing schemes, for instance, the land for streets (except the main roads) “has been taken as part of the net housing area”¹—but some inference can be drawn from the increasing road mileage since the war. Between 1946 and 1953, nearly 2,400 miles were added to the length of public highways in England, mainly housing estate roads.²

Every public enquiry held under the Town and Country Planning Act, 1947, shows the fierce competition that takes place for land, whether built-on or rural. Thirty years of open

¹Ministry of Housing and Local Government, *The Density of Residential Areas*, p. 34. H.M.S.O., 1952.

²Ministry of Transport, *Report on the Administration of the Road Fund*, H.M.S.O., published annually. The Road Fund Reports give separate data for the road mileage in Rural Districts, Urban Districts (including Municipal Boroughs) and County Boroughs, but the growing figures for boroughs and urban districts reflect to some degree the transfer of existing roads from rural districts, resulting from boundary extensions or from the creation of new urban districts. However, these and other figures in the Reports make it safe to attribute the chief part of the total lengthening to the construction of new residential streets.

development have given a new, sinister meaning to the formerly appreciative term "annihilation of space." As already mentioned, the question at issue here is not how much of the nation's land should be devoted to agriculture, nor is it whether a policy held to be desirable on social grounds is uneconomic ; the pertinent point is that the choice between various land-use policies involves a choice between various social values. The difficulty of choice has greatly increased through technical progress, but it existed a century ago—witness Charles Dickens' reply to the advocacy of cottages with private gardens for workers' families in London :

"If you go into any common outskirts of the town, now, and see the advancing army of brick and mortar laying waste the country fields and shutting out the air, you cannot fail to be struck by the consideration that if large buildings had been erected for the working people, instead of the absurd and expensive separate walnut shells in which they live, London would have been about a third of its present size, and every family would have had a country walk, miles nearer to their own door." ¹

Low building density is an instance of the fallacy of composition : if *some* families have houses with private gardens, they benefit, without harm being done to the community ; but open development applied *generally* enfeebles social as well as economic life, as will be shown more fully below.

The question whether transport does not absorb too much of the country's resources arises also with regard to man-power. In 1951, almost two million persons, or about 9% of the total in civil employment in Great Britain, were engaged in land transport, vehicle manufacture and ancillary industries.²

(b) *Loss of Time.*

While the limited amount of a country's space is the ultimate bar to low density of settlement, a more immediate bar is the non-expansibility of time. Up to a point, speed of transport, just as it brings more land within reach of a given

¹*Letters from Charles Dickens to Angela Burdett-Couts, 1841-1865*, p. 199, London, 1953.

²Derived from the Census of Population, 1951, One per cent. Sample Tables (Industries).

place, also puts more time at our disposal, by shortening the duration of transit. The duration at which transport begins to have diminishing returns varies from case to case and is difficult to determine. The saving of time may not be great on a single journey or haul, but when such movements are made frequently, a shortening by twenty or even by ten minutes can make a considerable difference. This is experienced in the daily journey to work, and it applies also to goods traffic. Mr. W. F. Luttrell has found that where delivery to and back between main works and branch is possible in the course of a morning, the planning of production is quite easy, but that where the distance is longer, greater stocks must be held and the cost of a liaison staff may be considerable.¹

The amount of time lost depends on mileage, speed of the vehicle, flow of traffic; for the users of public means of transport, also on frequency of service and on ease of access to train or bus. In all these respects, low building density puts the traveller or haulier at a disadvantage.² Although some of the losses in time are measurable in terms of money, the majority are not, as they are borne by private persons in their own time.

(c) *The Costs of Transport.*

It is only imperfectly known what proportion the expenditure on transport bears to the total national expenditure,³ and it seems hardly possible to lay down the optimum proportion. The services which transport renders to enjoyment and enrichment of life and to productivity are certainly worth a price, but this does not mean that the costs of transport do not matter. The lengthening of distances which goes with dispersal has, however, been allowed to happen with scant regard to the consequent rise in the costs of transport.

The recurring rises of passenger fares have become a general worry; they are, as is also the prolonged time taken up

¹*The Cost of Industrial Movement*, p. 85 (Occasional Paper No. XIV, Nat. Inst. of Econ. and Soc. Research), Cambridge, 1952.

²See K. Liepmann, *loc. cit.*, p. 50 fol.

³In "Estimates of Expenditure on Road Transport in Great Britain," *Journal of the Royal Statistical Society*, Series A, Part II, 1952, p. 191, Mr. Ernest Rudd suggests that "about three-quarters of the nation's expenditure on internal transport in 1949 and 1950 was on road transport, and that in those years roads and road transport absorbed over 10% of the community's available resources."

by journeys, largely due to the dispersal of residences and undertakings which has led to "a substantial increase in length of journey since pre-war"¹; this was bound to make the average journey more expensive, even if the rate per mile had remained unchanged. More than that, extension of a transport network to thinly populated districts is liable to raise fares throughout the area, the outer sections of the routes having to be subsidised by those nearer to the centre.²

Goods traffic costs arise in the course of production and in the course of distribution. As a proportion of total production cost, freight charges are now in many, particularly the light, industries of small account. But some transport costs are concealed in the costs of raw materials, as in the clothing industry where "cloth usually comes in carriage paid."³ Moreover, throughout industry, an important element of transport cost is hidden in the wage-bill, *viz.* the fares for the journey to work which raise the real proportion of total production cost attributable to transport.

The transport costs of distribution have become much heavier through the cumulative influences of open development decentralisation and enclosure; the provision of each neighbourhood, small in population but large in area, with consumers' goods—whether by delivery from depots to houses, like that of coal and of milk, or *via* a dozen small local shops each of which has to be stocked by manufacturers and/or wholesalers—increases the vehicle mileage and thereby transport costs. Indirect evidence of this is provided by an inquiry into goods transport by road in 1952.⁴ A salient result was the

¹*British Transport Commission, Report and Accounts for 1952*, p. 21, H.M.S.O.—In the London Transport area, *e.g.*, the number of passenger journeys was 12.4% higher in 1952 than in 1938-39, but the number of passenger miles, 33.6%, causing an increase of 18.8% in the length per journey (derived from Report and Accounts for 1948 and for 1952, p. 139 and p. 331 respectively).

²See, *e.g.*, D. L. Munby, "Transport Costs in the North of Scotland," *Scottish Journal of Political Economy*, Vol. I, 1954, No. 1, p. 76.—The case for and against flat rates cannot be argued here, but see p. 88 below.

³D. C. Hague and P. K. Newman, *Costs in Alternative Locations: The Clothing Industry*, p. 37 (Occasional Paper No. XV, Nat. Inst. of Econ. and Soc. Research), Cambridge, 1952.

⁴K. F. Glover and D. N. Miller, "The Outlines of the Road Goods Transport Industry" in *Journal of the Royal Statistical Society*, Series A, Part III, 1954.

major role played by "C" licence vehicles—they accounted for over 75% of the total vehicle mileage. While part of the "C" vehicles are used in the course of production, some 335,000, or nearly half of the small and medium-sized "C" vehicles (up to 2½ tons unladen weight), were found to be engaged wholly or mainly in carrying certain foodstuffs and other consumer goods. The inquiry showed further an unexpectedly high amount of long-haul traffic (of more than 40 miles), particularly by "C" licence vehicles. Although no comparison with previous years is possible, these findings help to confirm that dispersal involves extra movement of goods and thus higher transport costs of distribution. Delivery by shops is in this country little developed, so that carriage home is normally at the expense of the customer.

Another item of transport cost is the construction, improvement and maintenance of roads, including sewers and other piped and cabled services. There has been much complaint about the small capital investment since the war in the road system. However, to the expenditure on Trunk and Classified roads must be added that for the construction of roads (about two thousand miles) in new housing schemes. The sums spent on the construction of these residential streets are not made known.¹ But the Girdwood Committee which found that 'the cost of constructing roads and providing services has considerably increased owing . . . also to a lower density of development since the war'² published figures which make a rough estimate possible: the cost, from 1945 to 1954, of constructing new residential roads in England would seem to have

¹On the one hand, the "Analyses of Expenditure on Roads and Bridges" which are published in the annual *Report on the Administration of the Road Fund* omit these costs: the tables relate to expenditure by highway authorities only, whereas the construction of housing estate roads is the responsibility of the housing authorities; (the length of the housing estate roads, however, is included in the Road Fund Report's table "Mileage of Public Highways," because the highway authorities are responsible for their upkeep). In the housing accounts, on the other hand, the cost of road and sewer construction is not shown separately from the cost of house building proper—the construction of roads, etc. qualifies for exchequer grants as part of new housing schemes under the Housing (Financial and Miscellaneous Provisions) Act, 1946.

²*The Cost of House Building*, First Report of the Committee of Inquiry appointed by the Minister of Health, p. 11. H.M.S.O., 1948.

been of the order of £150 mill.¹ Figures on the cost of maintaining, lighting and cleansing housing estate roads are not available.² The Ministry of Housing and Local Government has now suggested forms of estate lay-out, widths and construction methods of roads and sewers which—at somewhat higher but still low building density—would reduce the area of road and footpath per dwelling by nearly 30% and the cost by £35-50,³ or approximately 25% of the site development costs in current housing schemes.

The full costs of dispersal are difficult to appreciate, because a considerable part of these costs is met by public spending, and another part, though borne by the consumers, is averaged over the whole country or a large region and concealed in the prices of goods and services. If the price system were allowed to work more freely than at present, this would show up the different actual costs of transport and of rendering services in areas of different size, location and building density, just as the calculation of economic rents for all users of land—allowing for social costs but also for expenditure by the public sector—would expose extravagant use and mis-allocation of land.

(d) Social and Economic Enfeeblement

If the direct disadvantages of dispersal—land being eaten up, loss of time and transport costs—are insufficiently recognised, it is even less understood that they have in addition the indirect result of impeding social cohesion and economic vigour and stability. The technical feasibility of dispersal obscures the fact that socially and economically its fulsome application is harmful. The reason is that dispersal is contrary to the modern need for manifold and flexible contacts between great numbers of individuals and groups, of works and services.

¹This estimate is based on the costs per house of site development outside the curtilage, 1947-1951: Third Girdwood Report (1952), p. 7, and on the *Housing Return for England and Wales*, 31st March, 1954. Cmd. 9135.

²The average expenditure for maintenance, repair and minor improvement was £271 per mile of *all* Unclassified roads in English Municipal Boroughs and Urban Districts in 1952/53 (Road Fund Report, p. 20).

³*Houses*, 1953, pp. 52 and 53. H.M.S.O.

The small town or area is no longer self-sufficient either socially or economically. Fortunately, the progress of transport and other technical advances make it to-day possible for society to benefit from the economies of scale without incurring the former evils of urbanisation ; the essential interaction between great numbers need no longer mean agglomeration in huge cities or conurbations. But the combined application of open development, enclosure and decentralisation proves on closer scrutiny to burden the country with very high costs, both social and economic.

Social life is impaired by open development : low building density fails to provide for the neighbourliness, engendered by propinquity, which continues to be a human need ; accessibility by transport is but one of the threads of which a firm social fabric is woven ; the telephone helps to keep people in contact, but merely one in six households has a telephone.¹ The device of enclosure is at variance with the large sizes of "catchment areas" of the various social services and activities ; its aim of achieving well-knit communities by smallness in numbers ignores the fact that the former local co-operation and interdependence in work, civic responsibility and mutual help no longer exist, so that natural local contacts are greatly reduced.

From the *economic* point of view, it is, in Professor W. Arthur Lewis's words,

"in any case doubtful whether dispersal could ever get far ; factories like to be close together, where they can share good basic industrial facilities ; there are some industries which could survive without subsidy dispersed in lonely rural isolation, but they are not very numerous."²

Linkage, *i.e.* continual interaction between establishments of various manufacturing and service industries, is the indispensable complement of specialisation. Examples of new types of linkage are the dependence of assembling plants on being fed with components and the reliance of branch factories on the parent works' managerial and technical staff. A relevant case, given by the present writer in a yet unpublished study of labour

¹Out of the country's over six million telephones, only some two million are those of private subscribers (Information from the Post Office Library).

²*The Principles of Economic Planning*, p. 80, London, 1949.

market areas is the recent establishment by a shoe factory in the South-West of half-a-dozen branch factories within a twenty-mile radius of the parent works; this development may well be the beginning of a new region of the shoe and allied industries. The term linkage has indeed become an understatement, and Professor Sargant Florence speaks of a "complex concatenation of linked industries."¹ Although nowadays such activities need not lie cheek by jowl, the links are not broken; links have become longer, but also more numerous.

Easy interplay between a variety of factories, service plants, consultants, etc. is particularly important for the sake of flexibility of the economic structure which is as much in the interest of the workers as in that of managements and of the country as a whole.

The adverse effects of dispersal, in its various manifestations, on economic prosperity and flexibility seem to increase with the distance from a large industrial centre;² however, owing to the worker's smaller range of movement (short of migration), there are some differences between the effects on the interests of employers and of employees; and certain special circumstances prevail in the Development Areas.

The spread of towns brought about by open development is of comparatively little importance from the management's point of view, since private cars easily overcome the greater mileage involved (although traffic jams reduce the speed), and since, as discussed above, goods haulage between factories up to at least 30 miles is no serious handicap to production planning. Even so, as open development lengthens the distances between factories, it is bound to increase the cost of running vehicles "closely akin to the conveyor belt of assembly line production, carrying partially manufactured components

¹*The Logic of British and American Industry*, p. 87, London, 1953.

²The Progress Report, *Town and Country Planning*, 1943-1951 (Cmd. 8204) qualifies the Minister's view that "the greatest possible emphasis should be laid on the separation of the new community from (a large town)" (p. 124) by stating that "for example, a New Town to relieve an overcrowded city must not be too far distant if people are to move out willingly. The locality must also be one which industry is likely to find attractive." (p. 125).

from one factory to another.”¹ For the worker, low building density in a big town means long and costly journeys to work.

Decentralisation of industry and population to small towns, if within, say, 40 miles from a big city or industrial area, will impede firms not more than does open development without enclosure, whereas workers lose the advantages of a large labour market at much shorter distances.

If the small “reception” town is farther away from a centre, the firm’s fortunes are liable to suffer as well as the employees’. Seen from the management’s angle, linkage is insufficiently provided for, both with other manufacturing firms and with professional and commercial services. From the workers’ point of view, the range of available jobs in a small or medium-sized area is limited, even where there is some variety of industry and occupation. Balance and stability of employment may be jeopardised by a technical innovation, by the fluctuations of the trade cycle, or by a disturbance in world markets; and adjustment is difficult to achieve within a small industrial area and labour market.

Decentralisation of factories to Development Areas also raises serious issues for both firms and workers. This decentralisation is one of industry only, to create employment for the population already living there—some of the districts are very populous. Firms find that opportunities for linkage are lean and narrow, for the old staple industries continue to be dominant, and what commercial and professional services exist are specialised to fit the staple industries. Firms also find it difficult to persuade their technical and managerial staff to move to Development Areas. Distances from the main centres of economic activity are inconveniently and expensively long. In fact, few firms have migrated in their entirety to the Development Areas and most of the new jobs there are in branch and subsidiary factories. This has—in spite of the considerable number of new jobs—a deleterious influence on the employment interests of the local workers. There are but restricted chances for promotion and few openings for craftsmen of higher skill, for technicians and for professional men. Besides, there is reason to fear that in a recession these areas will again be

¹Glover and Miller, *loc. cit.*, p. 314.

particularly vulnerable to unemployment.¹ The Development Areas have, therefore, so far not reaped the benefits of full-fledged industrial regions.

A new approach to the problems of the Development Areas appears to be needed. A relevant proposal has been put forward for Scotland.² Instead of trying to steer to Development Areas random industries from outside, the resources available in each Area should be surveyed in the light of recent advances in science and technology. New industries would be established in the Area on the basis of the survey results, and whole firms would be located there, including the managerial, technical and research staffs. In this way, an organic growth of interlinked industries and thus genuine economic vigour of the Development Areas might be fostered.

V

The close inter-connection between land-use, location and transport has forced itself afresh on our attention. Land-use and choice of location have come to limit each other in consequence of the all-over accessibility which modern transport affords. On the one hand, extensive use of land for all sorts of purposes prejudices the selection of the best location for a given activity; on the other hand, location of urban residence and industry far outside the towns not only interferes with the use of rural land for cultivation and for enjoyment, but also hampers social and economic interaction.

A deadlock has been reached, and the policy of land-use stands in need of re-examination; in this, the importance of location ought to be a major consideration. There seems to be no doubt that dispersal has been carried too far. The following points have emerged as essential:

¹See J. Sykes' "Remedies for Localised Unemployment" in *Manchester School*, January, 1951; and "Remedies for Cyclical Unemployment in the North East," *ibid.*, January, 1952. A somewhat different view expressed on this matter (Hague and Newman, *loc. cit.*, p. 59) is based on the transitory advantage of up-to-date production methods in the plants in the Development Areas as against older techniques in the parent factories.

²A. K. Cairncross and R. L. Meier, "New Industries and Economic Development in Scotland" in *The Three Banks Review*, June, 1952, p. 6.

Husbanding of the country's land is imperative ; the urban fabric should be tightened and deliberate use should be made of the third dimension of space, particularly for non-residential purposes.

From social and economic considerations alike, location of houses, communal buildings and industrial premises should aim at providing for the interplay between large numbers of people and between numerous and varied industrial undertakings.

Transport should be used for tempering the compactness of towns and for making access to the countryside easy ; for administering to the freedom of choice ; for bringing small old towns and villages within easy reach of larger centres ; for connecting the several regions of the country ; for promoting the flexibility of the economic system.

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Economic Expansion and International Trade¹

The problem of the effects of economic growth on international trade has excited increasing interest since the war, in connection with discussions of "dollar shortage" and the development of "under-developed countries," and more recently of Britain's long-run economic prospects. This article examines, as a background to such discussions, the theoretical effects of economic expansion on the volume and terms of trade between manufacturing and primary-producing countries. By "economic expansion" is meant the growth of output, whether as a result of population growth, capital accumulation, or technical progress: it is assumed that these causes of expansion can in principle be isolated one from another, and that certain technical difficulties in defining them can be ignored. The analysis is concerned with the adjustments required to maintain international equilibrium, on the assumption that full employment is maintained and that competitive conditions rule in the markets for goods and factors of production. For simplicity, the argument is presented in terms of two countries, Mancunia and Agraria; Mancunia is assumed to export manufactured goods, and Agraria to export foodstuffs. It is further assumed that manufactures are a luxury good and foodstuffs a necessary good, in the technical sense that the income-elasticity of demand for manufactures is greater, and the income-elasticity of demand for foodstuffs less, than unity.²

In Part I it is assumed that each country is completely specialized on the production of the type of good it exports, and completely dependent on imports for its consumption of the other good; in Part II the countries are assumed to be incompletely specialized, producing domestically some of the imported good. In both Parts it is assumed that labour, capital,

¹This article is based on three lectures delivered in Manchester in December, 1954.

²As income per head rises, proportionately more is spent on manufactures, and proportionately less on food, if prices remain constant.

and technology are immobile between countries, and that only goods can move internationally; Part III deals briefly with some of the effects of international transmissions of productive power.

I. ECONOMIC EXPANSION WITH COMPLETE SPECIALIZATION.

In equilibrium, the volume and terms of trade must be such that each country's exports pay for its imports. Now suppose that Agraria's economy is static, but Mancunia's economy is growing. At unchanged terms of trade, Mancunia's demand for imports would increase at a rate equal to the product of the rate of growth of its output and its output-elasticity of demand for imports.¹ To preserve equilibrium, the terms of trade must turn against Mancunia, in order to induce residents of both countries to divert their consumption from food to manufactures; thus part of the benefit of Mancunia's expansion accrues to Agraria through a cheapening of its imports of manufactures. Expansion in Mancunia also necessarily involves expansion of the volume of trade, measured in manufactured goods; the volume of trade, measured in foodstuffs, will increase so long as Agraria's demand for imports is elastic.

The division of the benefits of Mancunian expansion between the two countries depends on the extent to which the terms of trade must change to restore equilibrium. The conditions which determine this can be formulated in two alternative ways: in terms of international trade theory, it depends on the elasticities of the two countries' demands for imports; in terms of value theory, it depends on the elasticity of world (i.e. both countries') demand for manufactured goods.

To be formally precise, the effect of a deterioration of a country's terms of trade on its trade balance is given by the expression

$$\frac{\delta B}{\delta p} = \frac{\delta (X - pM)}{\delta p} = \frac{X}{p} (\eta_x + \eta_m - 1),$$

¹ "Output-elasticity" is used in preference to "income-elasticity" to describe the behaviour of aggregate consumption as aggregate income rises, to include the effects of increasing numbers as well as increasing income per capita.

where B is the trade balance (initially zero), X and M are the initial quantities of exports and imports, p is the price of imports relative to the price of exports,

$$\eta_x (= - \frac{p}{X} \frac{\delta X}{\delta p})$$

is the elasticity of demand for the country's exports, and

$$\eta_m (= - \frac{p}{M} \frac{\delta M}{\delta p})$$

is the elasticity of the country's demand for imports. Hence the proportional deterioration of the terms of trade which is required to improve the trade balance by a given proportion of the initial value of exports or imports is equal to the proportional improvement required, divided by the sum of the elasticities of demand for imports and exports, minus one (i.e.

$$\frac{dp}{p} = \frac{dB}{X} \div (\eta_x + \eta_m - 1),$$

where dB is now the required improvement in the balance). For brevity, the term $(\eta_x + \eta_m - 1)$ will henceforth be described as "the elasticity factor." Since Mancunia's expansion would worsen its trade balance (at unchanged terms of trade) in a proportion equal to the product of its rate of growth and output-elasticity of demand for imports, the rate of deterioration of Mancunia's terms of trade which is required to maintain balance will be equal to this product, divided by the elasticity factor

$$\text{(i.e. } \frac{1}{p} \frac{dp}{dt} = \frac{\Sigma R}{Y \frac{\delta M}{\delta Y}} \text{),}$$

$$\text{where } \Sigma = \frac{1}{M} \frac{\delta Y}{\delta Y}$$

is the output-elasticity of demand for imports and

$$R = \frac{1}{Y} \frac{dY}{dt}$$

is the rate of growth of output).

Since a country's trade balance is the difference between its national product and national expenditure, the effect of a deterioration of its terms of trade on its trade balance may be expressed alternatively in the form

$$\frac{\delta B}{\delta p} = \frac{\delta (Y - E)}{p} = - \frac{Y}{p} \eta_Y,$$

where Y is the country's total output,

$$\eta_Y \left(= \frac{p}{Y} \frac{\delta Y}{\delta p} \right)$$

is the elasticity of world demand for that output, and E is the country's total expenditure, which on the assumption of full employment will be unaffected by changes in the terms of trade. Hence the elasticity factor of the preceding paragraph may be replaced by the elasticity of world demand for the country's product, divided by the ratio of exports to total output, i.e.

$$\eta_x + \eta_m - 1 = \eta_Y \div \frac{X}{Y}$$

and the rate of deterioration of Mancunia's terms of trade which is required to maintain balance will be equal to the product of its rate of growth and marginal propensity to spend on imports, divided by the elasticity of world demand for manufactures

$$\left(\text{i.e. } \frac{1}{p} \frac{dp}{dt} = \frac{mR}{\eta_Y}, \text{ where } m = p \frac{\delta M}{\delta Y} \right) \text{ is the}$$

marginal propensity to spend on imports).

Given the rate of growth of Mancunia, the rate of deterioration of its terms of trade will be higher the higher its marginal propensity to spend on food, and the lower the elasticity of world demand for manufactures. The marginal propensity to spend on food may either rise or fall for a time, depending on the cause of expansion and the nature of the demand for food, but eventually it will rise; the elasticity of world demand for manufactures is practically certain to fall over time, since as

manufacturing output expands while food supply remains constant it will become increasingly difficult to induce people in both countries to consume manufactures rather than food. Consequently, at some stage continued growth of the Mancunian economy will begin to involve an increasingly rapid deterioration of Mancunia's terms of trade, and more and more of the benefit of Mancunian expansion will accrue to Agraria.

The rate of increase of Mancunia's real income will depend on the rate of growth of its output and the extent to which expansion turns its terms of trade against it. The loss of real income attributable to an adverse movement of the terms of trade may be approximated on the compensation principle, as being equal to the increased cost of imports resulting from the movement of the terms of trade. On this basis, the rate of increase of Mancunia's real income will fall short of the rate of increase of its output by a proportion equal to its marginal propensity to spend on food, divided by the elasticity factor. As time goes on, the contribution which further growth makes to Mancunian real income will decrease, because of the increasingly unfavourable effects on Mancunia's terms of trade. Eventually, Mancunia would arrive at a point beyond which further growth would actually reduce its real income, the adverse effect on the terms of trade more than offsetting the increase in output. This would occur when the marginal propensity to spend on imports became equal to the elasticity factor.

If expansion were due to technical progress or capital accumulation, this could only occur after Agraria's demand for imported manufactures became inelastic, because the marginal propensity to spend on imports in this case is equal to the income term in Mancunia's elasticity of demand for imports, and therefore is less than that elasticity by the amount of the substitution elasticity. But in the case of expansion arising from population growth, the marginal propensity to spend on imports is likely to be substantially greater than the income-effect in the elasticity of demand for imports, so that Mancunia might begin to lose in terms of real income before

Agrarian import demand became inelastic.¹ In either case, Mancunia will cease to benefit from growth long before the world is glutted with manufactured goods—a paradox more familiar in relation to agricultural production than industrial, and which qualifies the popular assumption that industrial expansion is a rapid and sure means of raising real income.

So far, it has been assumed that Mancunia's international trade is conducted competitively. Mancunia could avoid part of the loss from the deterioration of its terms of trade, and prevent itself from ever encountering a loss of real income from expansion, by imposing appropriate trade controls and adjusting them as it grew. The optimum degree of trade restriction at any moment would be that which equated the ratio of the marginal utility of imported food to the marginal utility of manufactures, with the marginal increase in exports required to obtain a unit increase in imports. This could be attained by levying an import duty equal to the reciprocal of the elasticity of supply of imports from Agraria, the elasticity being calculated at the optimum volume of trade. As Mancunia expanded, its optimum trade volume would increase; whether the optimum degree of trade restriction would decrease or increase would depend on whether the elasticity of Agraria's demand for manufactures increased or decreased. Eventually, however, Agraria's demand for imports would become decreasingly elastic, and Mancunia would gain by increasing the degree of trade restriction as its output expanded; but it would never again by increasing restrictions to the point of actually reducing its imports. On the other hand, it would never pay Mancunia to allow its exports to expand to the point at which Agrarian import demand became inelastic. Given appropriately restrictive trade policies, Mancunia would gain by growth so long as manufactured goods were useful to its citizens.

So far, it has been assumed that Mancunia alone is growing; and it has been shown that in this case the gain from Mancunian

¹Alternatively, Mancunia would begin to lose from growth when the elasticity of world demand for manufactures became equal to the product of Mancunia's average and marginal propensities to import; except in extreme cases of population growth, this would occur after world demand for manufactures became inelastic.

expansion passes increasingly to Agraria through the deterioration of Mancunia's terms of trade, unless Mancunia follows an appropriate trade policy. The most important implication of the argument is that Mancunia will benefit more from expansion if Agraria is also growing than it otherwise would ; a corollary, excluded by assumption, is that Mancunia may benefit by investing labour, capital or technical skill in fostering the expansion of Agraria, even at the cost of reducing the rate of growth of Mancunian output.

If both economies are growing, the demand of each for the other's exports will increase at a rate determined by the product of its rate of growth and output-elasticity of demand for imports. The terms of trade will turn against the country for which this product is greater ; this is not necessarily the country which is growing more rapidly, because a higher growth rate may be offset by a lower output-elasticity of demand for imports.

If conditions were such that growth proceeded at unchanged terms of trade the rate of growth of real income in each country would be the same as its rate of growth of output. In a very limited sense, this situation could be described as "balanced growth" of the world economy;¹ for it to occur the rates of growth of output in the two countries must be inversely proportional to their output-elasticities of demand for imports—the country for whose exports the output-elasticity of demand is relatively low must expand relatively less rapidly.

If economic expansion is due to capital accumulation or technical progress, real income per head will be rising ; on the assumption that manufactures are a luxury good and food a necessity, the output-elasticity of Mancunia's demand for imports will be less than unity and that of Agraria's demand for imports will be greater than unity.² For balanced growth,

¹The phrase has a limited meaning because it does not imply equality of the rates of increase of either aggregate or average real income in the two countries, not does it imply that "balanced growth" is in any sense superior to "unbalanced growth"; it merely means that there is no international income-redistribution through changes in the terms of trade.

²In terms of concepts developed in Part II, economic expansion is import-biased in Mancunia and export-biased in Agraria in these cases.

Agraria must expand less rapidly than Mancunia. Agraria will not necessarily be worse off if it grows more rapidly than the requirement for balanced growth indicates—its real income will increase more rapidly the higher its growth rate so long as the elasticity factor exceeds its marginal propensity to spend on manufactures—but part of the benefits of more rapid growth will accrue to Mancunia. If the outputs of the two countries grow at the same rate, Mancunia's real income will grow more rapidly than Agraria's.

This conclusion provides a theoretical foundation for an argument sometimes advanced in favour of industrialization of backward countries, namely that in the long run world economic progress is biased against primary production. To derive an argument for industrialization from it, however, it is necessary to consider the relative costs of industrial as against agricultural expansion, and the relative rates of expansion which are in fact likely to be attained. The conclusion, moreover, is confined to cases of expansion due to capital accumulation or technical progress: if expansion is due to population growth and entails falling real income per head, the terms of trade will turn in favour of Agraria unless Mancunia is expanding relatively less rapidly, and the argument would provide a case for agriculturalization of Mancunia. This case might arise even if Mancunian expansion were due to other causes than population growth, so that the output-elasticity of demand for imports was less than unity in both countries.

Throughout the foregoing argument, it has been assumed that the output-elasticities of demand for imports will be positive. In concluding this section, three possible exceptions should be mentioned. First, one country's output may be inferior in the consumption of the other, so that if the latter's output expands due to capital accumulation or technical progress (raising real income per head) its demand for imports will fall. Second, if population growth in Agraria encounters strongly diminishing returns, the reduction in income per head may reduce individual demand for manufactures so much as to outweigh the effects of the increasing number of heads. Third, if instead of foodstuffs Agraria produces industrial raw materials the demand for which is derived from the demand

for manufactured goods, technical progress in Mancunia might operate so as to reduce the materials required per unit of output faster than total output increases. To make sense of this last case, however, it must be assumed that the materials are either directly consumable in Agraria or substitutable for factors of production in Mancunia—otherwise equilibrium could not be maintained by changes in the terms of trade. In all three cases, expansion of the country with the negative output-elasticity of demand for imports would reduce the volume of world trade and turn the terms of trade in its favour.

II. ECONOMIC EXPANSION WITH INCOMPLETE SPECIALIZATION

The argument of Part I assumed that each country was completely specialized on the production of its export good; this Part is concerned with the more realistic case in which each country produces domestically some of the goods which it imports.

For countries to be incompletely specialized in this way, and to remain so as expansion proceeds, it is necessary to assume that each country can only increase the relative amount of one of the goods which it produces at increasing relative cost. The increasing relative cost of production of a good as its relative production is increased may be due to either or both of two causes: diseconomies of scale in one or both lines of production, and differences in factor-intensities, which mean that, with constant factor supplies, diversion of production towards one of the goods reduces the demand for and relative price of the factor used relatively less in producing that good, thereby lowering the relative price of the other good. In what follows, it is assumed that agriculture is subject to diminishing returns as output expands, owing to the application of more labour and capital to a given supply of land, but that manufacturing makes negligible use of land and is subject to constant returns to scale. It is also assumed that agriculture is relatively labour-intensive, and manufacturing is relatively capital-intensive, in both countries.¹

¹This would imply that a shift of production from manufacturing to agriculture would tend to raise wages (and rent) and lower the earnings of capital; the effects of such redistributions of income on demand are ignored in the argument below.

With incomplete specialization, a country's demand for imports is the difference between its total demand for and domestic supply of the good concerned. Economic expansion will increase the total demand, but it may increase the domestic supply still more, at constant relative prices; consequently, in contrast to the case of complete specialization, expansion may reduce a country's demand for imports and tend to turn the terms of trade in its favour.

Whether a country's expansion increases or reduces its demand for imports, the change in the terms of trade required to restore equilibrium will depend, as before, on the elasticity factor; but the elasticity of demand for imports will now depend on the elasticities of total demand for and domestic supply of the imported good. In terms of value theory, the elasticity factor is equal to the sum of the elasticities of world demand for and world supply of one of the goods, divided by the ratio of world trade in that good to world production or consumption.

Economic expansion with incomplete specialization poses two major questions. The first, which was mentioned briefly at the end of Part I, is whether a country's demand for imports expands more than or less than proportionately to the expansion of its output—whether, that is, its expansion tends to increase or decrease the relative importance of international trade. The second, mentioned above, is whether expansion will actually reduce a country's demand for imports, and so tend to damage the welfare of the other country by turning its terms of trade against it. In each case, the answer depends on the cause of expansion.

For further analysis, it is convenient to distinguish between the effects of expansion on consumption and production (at constant prices), and to classify them into three possible types—"export-biased," "neutral," and "import-biased"—according to a terminology borrowed from Professor Hicks.¹ On the consumption side, an expansion will be described as "neutral"

¹J. R. Hicks, "An Inaugural Lecture," *Oxford Economic Papers*, New Series, Vol. 5, No. 2 (June, 1953), pp. 117—35, especially pp. 127 ff. Professor Hicks is concerned only with ultra-bias on the production side. The symmetry of the definitions employed here with his may be most easily appreciated by remembering that a demand for imports is equally a supply of exports,

if it increases the total demand for importable goods in the same proportion as it increases the demand for exportable goods; biased against imports or "import-biased" if it increases the demand for importable goods in lesser proportion than it increases the demand for exportable goods; and biased against exports or "export-biased" if it increases the demand for importable goods in greater proportion than it increases the demand for exportables. On the production side, an expansion will be described as "neutral" if it increases the supply of exportable and importable goods in the same proportion, "import-biased" if it increases the supply of importable goods in greater proportion than the supply of exportable goods, and "export-biased" if it increases the supply of importable goods in lesser proportion than the supply of exportable goods. If expansion reduces the domestic supply of importable goods it will be described as "ultra-export-biased"; and if it reduces the supply of exportable goods it will be described as "ultra-import-biased."¹

An expansion which is export-biased or import-biased on both sides will be export-biased or import-biased on balance. Likewise, an expansion which is neutral on both sides will be neutral on balance; but an expansion which is equally export-biased on one side and import-biased on the other² will not be neutral, because consumption of imports exceeds domestic production—for neutrality, bias on the consumption side must be offset by a greater opposite bias on the production side. Ultra-import-bias on the production side implies ultra-import-bias on balance, because it means that domestic production of importables increases more than total output and therefore demand for importables; ultra-export-bias on the production side excludes the possibility of ultra-import-bias on balance, for similar reasons, but it does not exclude the possibility of import-bias on balance.

The effects of different types of economic expansion in the two countries on their demands for imports may now be examined in detail. We shall begin with the effects of economic

¹Parallel cases of ultra-bias on the consumption side are excluded for simplicity; possible causes have been mentioned in Part I.

²The degree of bias is measured by the divergence of the output-elasticity of demand or supply from unity.

expansion in Mancunia, then consider the effects of expansion in Agraria, and finally consider the effects of expansion in both together.

If economic expansion in Mancunia is due to technical progress, it will be import-biased on the consumption side, since it will raise real income per head and (by assumption) increasing income per head will be spent relatively more on manufactures than on food. The effects on the production side will depend on whether technical progress proceeds more rapidly in one line of production than in the other, and whether it is capital-saving, labour-saving, or neutral in each case. For simplicity, it will be assumed that technical progress merely raises the output obtainable from a given combination of factors of production without making it advantageous to alter the combination employed, so that the effects will depend only on whether it proceeds at the same pace in both lines of production, or more rapidly in one or the other.

If technical progress proceeds more rapidly in one sector, output in that sector (at constant prices) will increase more than proportionately to total output for two reasons: first, with unchanged factor-employment in the two sectors its output will rise more rapidly than output in the other sector: second, factors of production will shift into that sector until rising costs there and decreasing costs in the other sector equalize factor earnings in the two sectors. Whether output in the other sector actually declined would depend on the relative rates of progress in the two sectors, and the degree to which relative costs altered as factors shifted from one sector to another; but if progress occurred in one sector only, output in the other sector would necessarily fall.

The classical economists took the view that technical improvements in agriculture would be of negligible importance in the long run, as compared with improvements in industry; on that assumption, technical progress in Mancunia would be ultra-export-biased in production, and Mancunian demand for food imports would increase with expansion, though they might increase more or less than proportionately to the expansion of output. The classical view, however, has not proved a valid historical generalization; on the more tenable assumption

that technical progress proceeds at approximately the same pace in both lines of production, expansion in Mancunia due to this cause would be import-biased on balance, and might be ultra-import-balanced if the output-elasticity of demand for food were sufficiently low.

Expansion due to capital accumulation will also be import-biased on the consumption side, since it will raise income per head. On the assumptions stated earlier, that manufacturing is relatively capital-intensive and subject to constant returns while agriculture is relatively labour-intensive and subject to decreasing returns, capital accumulation will be ultra-export-biased on the production side: it will reduce agricultural output at constant prices. This rather unexpected conclusion may be established by the following argument, the general lines of which were originally developed by Mr. T. M. Rybczynski of the London School of Economics.¹

If agricultural output were kept constant as capital accumulated, the ratio of capital to labour would have to increase in both agriculture and manufacturing, in order to absorb the extra capital. This in turn would imply a reduction in the earnings of capital, relative to wages. Since agriculture is assumed to be relatively more labour-intensive than manufacturing, the cost of food would rise relatively to the cost of manufactures. To restore the ratio of relative costs to its initial level, agriculture would have to contract and manufacturing expand still further, reducing the relative cost of agricultural production by lowering the capital-to-labour ratio in both industries and by raising the combined marginal productivity of labour and capital in agriculture.

Capital accumulation will therefore be ultra-export-biased on the production side; and expansion due to this cause will necessarily increase Mancunia's demand for imported food, though the demand may increase more or less than proportionally to the expansion of Mancunia's total output.

Expansion due to population growth will be export-biased on the consumption side, since it will tend to reduce real

¹The writer first encountered the argument in a paper read by Mr W. M. Corden to the Oxford-London-Cambridge Joint Seminar at Cambridge, in November, 1954.

income per head. On the production side, its effects will not necessarily be the reverse of those of capital accumulation, owing to the assumption of diminishing returns in agriculture. Population growth will tend to promote expansion of agricultural production. If agriculture, like industry, were subject to constant returns, the expansion of agricultural production would have to go far enough to reduce manufacturing output : maintenance of the initial relative cost ratio would require maintenance of the initial capital-to-labour ratios in the two sectors, which in turn would require sufficient contraction of manufacturing to release the capital needed to equip the additional labour for agricultural production. But with diminishing returns in agriculture raising the relative cost of food as production expands, expansion of both agriculture and manufacturing might be required to absorb the additional labour at unchanged relative prices of food and manufactures. Consequently population growth need not be ultra-import-biased on the production side ; it might even be export-biased, if diminishing returns operated strongly in agriculture, though it could not be ultra-export-biased. On balance, expansion due to population growth in Mancunia may therefore be export-biased or import-biased, and even ultra-import-biased.

Having surveyed the effects of different kinds of expansion in Mancunia, let us consider the effects of expansion in Agraria. Expansion due to technical progress in Agraria will be export-biased on the consumption side, since rising real income will be spent proportionately more on manufactured goods. Unless technical progress proceeds more rapidly in manufacturing than in agriculture, expansion due to this cause will be export-biased on balance ; if it proceeds more rapidly in manufacturing, expansion may be import-biased. In the classical case of negligible agricultural progress, expansion would be ultra-import-biased on balance, promoting self-sufficiency.

Expansion due to capital accumulation will also be export-biased on the consumption side ; but it will be ultra-import-biased on the production side and therefore ultra-import-biased on balance, promoting self-sufficiency and tending to turn the terms of trade in Agraria's favour. Expansion arising from population growth will be import-biased on the consumption

side. If returns diminish only gently in agriculture, population growth will be export-biased on the production side, and possibly ultra-export-biased if returns diminish sufficiently gently ; in the latter case, expansion may be import-biased or export-biased on balance, but not ultra-import-biased. On the other hand, if agricultural returns diminish strongly, population growth may be import-biased (though not ultra-import-biased) on the production side and therefore import-biased, possibly ultra-import-biased, on balance. The two extreme cases, of export-bias when agricultural returns diminish gently and ultra-import-bias when agricultural returns diminish strongly, have an obvious application to the problems of under-developed countries and the probable effects of population growth in certain parts of the world on the prospects for the terms of trade between manufactures and primary products.

This completes the examination of the effects of expansion of various types in the two countries on their demands for imports ; the results are summarized in the accompanying Table. It is now necessary to put the results together in an

SUMMARY OF EFFECTS OF EXPANSION

Type of Expansion	Mancunia			Agraria		
	Con- sumption	Produc- tion	Net Effect	Con- sumption	Produc- tion	Net Effect
I. <i>Technical Progress</i>						
(a) <i>Classical case</i>	I	UE	I or E, not UI	E	UI	UI
(b) <i>Equal rates</i>	I	N	I, possibly UI	E	N	E
II. <i>Capital Accumulation</i>	I	UE	I or E, not UI	E	UI	UI
III. <i>Population increase</i>						
(a) <i>Slightly Diminishing Returns</i>	E	UI	UI	I	UE	I or E, not UI
(b) <i>Strongly Diminishing Returns</i>	E	E not UE	E	I not UI	I, possibly UI	

I = Import-biased
E = export-biased
N = neutral

UI = ultra-import-biased
UE = ultra-export-biased

examination of the effects of expansion in both countries together. In doing so, it will be assumed that the cause of expansion is the same in both countries, though this is not necessarily the most interesting assumption to make.

If expansion is due to technical progress in both countries, and progress is equally rapid in both lines of production, its effects will be import-biased in Mancunia and export-biased in Agraria. Consequently, if progress is equally rapid in the two countries, the terms of trade will turn in Mancunia's favour and Mancunia's real income will rise more rapidly than Agraria's. If, on the other hand, Agraria is progressing relatively slowly as compared with Mancunia, Agraria will benefit from Mancunia's progress through a favourable movement of her terms of trade, though this may mean a much lower rate of increase of real income than Agraria would enjoy in the previous case. Moreover, as real income rises in Mancunia, a point may come at which Mancunia's expansion becomes ultra-import-biased, technical progress there raising food production more than enough to satisfy the growing demand for it ; at that point Agraria would begin to lose in consequence of Mancunia's expansion.

If technical progress proceeds more rapidly in manufacturing than in agriculture, it will tend to be export-biased in Mancunia and import-biased in Agraria, so that the terms of trade would tend to turn against Mancunia unless Agraria was expanding relatively faster. In the extreme classical case expansion would be ultra-export-biased in Mancunia and ultra-import-biased in Agraria, and the terms of trade would turn in Agraria's favour regardless of the relative rates of progress in the two countries.

If world expansion is due to capital accumulation, it will be ultra-export-biased on the production side in Mancunia and ultra-import-biased on the production side in Agraria, so that Mancunia's demand for imports will increase and Agraria's decrease. Capital accumulation tends to increase manufacturing output and decrease food output in both countries, thereby turning the terms of trade in favour of Agraria. The volume of world trade may either rise or fall over time, depending on the relative ease of diverting production from

industry to agriculture in the two countries ; if this is relatively easier in Agraria, the volume of world trade will increase.

The effects of world population growth are more complicated than those of world capital accumulation, since they depend on the strength with which diminishing returns operate in the agricultural sectors of the two economies. If returns diminish very gently in both countries, population growth will be ultra-import-biased in Mancunia and export-biased in Agraria, and the terms of trade will turn in Mancunia's favour. At the other extreme of strongly diminishing returns in both countries, population growth will be export-biased in Mancunia and import-biased, possibly ultra-import-biased, in Agraria, since in both countries most of the increased population would tend to be forced into manufacturing ; the terms of trade in this case would tend to turn in favour of Agraria. If diminishing returns operate strongly in Mancunia and gently in Agraria, population growth may be export-biased in both countries ; in this case the volume of world trade will expand relatively to world production, but the terms of trade may turn in either country's favour. In the converse case, the terms of trade would seem likely to turn in favour of Mancunia.

The effects of the combination of different types of expansion in the two countries may be worked out in the same sort of way, with the aid of the summary Table. Owing to limitation of space, this is left to the interested reader. The conclusions which emerge from the analysis may be summarized in the general proposition that expansion will tend to increase Mancunia's demand for imports, and reduce Agraria's demand for imports, except possibly when *either* expansion is due to technical progress which is not proceeding much more rapidly in industry than in agriculture, *or* expansion is due to population growth and agriculture is subject to only gently diminishing returns. Apart from these last two cases, expansion in either country or in both will tend to turn the terms of trade against Mancunia and in favour of Agraria.

III. INTERNATIONAL TRANSMISSIONS OF PRODUCTIVE POWER

Space permits only a few brief comments on the effects of international movements of labour, capital, and technical

knowledge. In the first place, all three may give rise to both a short-run and a long-run transfer problem. In the short run, the migration of labour, the construction of capital equipment in one country rather than another, and the communication of technical knowledge, may require the expenditure of a certain amount of current income in a different way than it otherwise would have been spent. In the long run, each may give rise to an international flow of income (migrants' remittances, interest, or royalties) and a different pattern of expenditure than would result if the income were retained in the country of origin. In both cases, the effect will be to make the terms of trade more favourable than they otherwise would be, for the country for whose export good demand is increased as a result of the transfer. On the assumption that capital and technology are exported by the country with the higher income per head, and labour by the country with the lower income per head, the resulting international income flows would tend to improve Mancunia's terms of trade in the former case, and Agraria's terms of trade in the latter case.

Apart from these transfer problems, the effects of international transmissions of productive power may be analysed on the lines of the preceding Part of this Article. The communication of technical knowledge from Mancunia to Agraria may be identified with the effects of technical progress in Agraria, and will have effects favourable to Mancunia so long as technical improvements are not largely confined to manufacturing; Mancunia will benefit more, the more the communication of progress can be confined to improvements in agricultural technique. Migration and foreign investment can be identified with population decrease in one country and increase in the other, or capital decumulation in one country and accumulation in the other. Unfortunately, except in cases of migration with widely different operation of diminishing agricultural returns in the two countries, no firm conclusions can be reached about the effects of factor movements on the terms of trade, unless much more specific assumptions than heretofore are introduced.

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Secular Swings in Production and Trade, 1870-1913

Ever since Professor Simon Kuznets published his *Secular Movements in Production and Prices* in 1930 we have known that a great many statistical series relating to the volume of economic activity (*i.e.* excluding price effects) show a secular fluctuation, of about 16 to 22 years duration, which is so pronounced that it dwarfs the 7 to 11 year cycle into relative insignificance. Professor Kuznets dealt with many industries and many countries, but somehow this secular fluctuation has become identified in most people's minds with the building industry. Professor A. F. Burns¹ reiterated the point in 1934, drawing on a very wide range of industries in the United States, and the point was made again by Professors Warren and Pearson² in 1937; but it was not until Professor Kuznets published his estimates³ of real income in the United States since 1869, and drew attention once more to the secular swing in output as a whole that the importance of this fluctuation in the American economy was generally recognised.

On this side of the Atlantic, the existence of a similar secular fluctuation in the British building industry was first pointed out by Professor A. K. Cairncross, in a series of studies culminating recently in the publication of his great work on British capital formation.⁴ From this work it also emerged that home investment other than in residential building had the same pronounced secular fluctuation as residential building; and that foreign investment had a secular fluctuation in the reverse directions. Next, Mr. E. W. Cooney demonstrated⁵ that the U.S. and the U.K. building cycles fluctuated in opposite directions to each other, thus raising the question how these two great economies, with investment cycles in opposite directions, reacted upon each other, and upon the rest

¹*Production Trends in the United States since 1870*, New York, 1934.

²*World Prices and the Building Industry*, New York, 1937.

³*National Product since 1869*, New York, 1946.

⁴*Home and Foreign Investment, 1870-1913*, Cambridge, 1953.

⁵"Capital Exports and Investment in Building in Britain and the U.S.A., 1856-1914." *Economica*, November, 1949.

of the world. This was the question to which Professor Brinley Thomas addressed himself,¹ starting from the angle of international migration, and he showed that the effect was an enormous secular fluctuation in the movement of people across the water, with the same duration, timing and direction as is found in the U.S. building cycle, and in the U.K. export of capital.

The purpose of this article is to explore further the effect of these countries' swings upon each other and upon the rest of the world. The article begins with the U.S. fluctuation, but does not linger with this fluctuation, since it is well known. The U.K.'s position is less certain; if foreign investment and home investment alternated with each other, did this keep the economy as a whole stable, or was there a secular swing, and if so, in which direction? Next the article considers the position of France and of Germany. From these it turns to the agricultural countries, considering both the statistics of world production and trade, and also series relating to individual countries. A picture thus emerges of inter-related secular fluctuations in the world economy in the forty years before the first world war. The purpose of the article is not mainly theoretical, but rather to see what the relevant statistics show, and to make a few comments on the results.

It is convenient to have a name to distinguish a secular swing from the other cycles in economic activity. Following the precedent of naming each cycle after the person who first focussed attention upon it—cf. the Kitchin 40-month cycle, the Juglar 9-year cycle, and the Kondratieff 50-year cycle—we suggest calling this the "Kuznets" cycle, hoping that Professor Kuznets will not take amiss this tribute to his pioneering work.

The series used are described in Appendix I. They are all "volume" series, *i.e.* physical series, or financial series deflated by price indices. The method used is the same in all cases: the series has been reduced to logarithms, and a straight line trend fitted by the method of least squares.² This trend shows

¹*Migration and Economic Growth*, Cambridge, 1954.

²There is one exception: the trend has not been removed from the series showing the percentage of unemployment in the U.K.

what the series would have been if it had grown at a constant rate throughout the period. The percentage deviations of the actual series from the trend are plotted, and are shown in the charts. The chart shows us simultaneously the level of the series and its rate of growth. For example, at any time the series may be above trend but stagnating, or below trend but showing vigorous growth. The rate of growth is deduced from the chart from the slope of the line, and not from its position above or below the trend.

Treating a series in this way gives queer results if the average rate of growth is not in fact about the same in the first half of the period as it is in the second half of the period. For example, if there is no growth in the first half, and rapid growth in the second half, the deviations when plotted assume the shape of a 'V.' Fortunately, most of the series in which we were interested show uniform growth ; the only series which we have had to discard as unsuitable for this treatment are those relating to New Zealand and to Canada.¹ Fitting a straight line trend is also misleading if there is constant retardation (or acceleration) in the rate of growth ; it may then be more appropriate to fit a parabola of second or higher orders. One disadvantage of fitting a second order parabola is that the chart of the deviations is no longer sufficient to tell us what is happening to the series ; when comparing different charts we have then to bear in mind that the trend of some may be subject to a sharp retardation (or acceleration) which is not present in others. Fortunately, most of the series in which we are interested show no retardation between 1870 and 1913, or such slight retardation that the difference between a first order and a second order parabola is negligible.

I. THE U.S.A.

We need not spend long with the U.S.A., since the general pattern of the economy's behaviour is well known, and easily described : decades of prosperity alternate with decades of

¹The volume of Canada's exports (for example) was the same in 1889 as in 1873 ; then from 1890 to 1913 the average annual increase was 5.5 per cent. per annum. See K. W. Taylor, "Statistics of Foreign Trade" in C. A. Curtis and others, *Statistical Contributions to Canadian Economic History*, Vol. I, Toronto, 1931.

relative depression. Peaks of prosperity were reached in 1873, in 1892 and in 1913 and troughs of depression occurred in 1878 and in 1896. Kuznets, Warren and Pearson, and Brinley Thomas have produced an enormous number of series which show this fluctuation, ranging from railway traffic and the production of pig iron to the number of patents registered and the number of marriages, so we may confine ourselves here to a few series which relate to the economy as a whole.

Series 1 in Chart I is Frickey's index of manufacturing production (from which the dates in the preceding paragraph were derived). It shows how marked is the secular swing, compared with all other fluctuations. Series 2 shows the volume of imports. This has the same swing, but gives rather a sharp drop in imports in the later 1880's. U.S. series differ as to the state of prosperity in the second half of the 80's, compared with the first half. Building activity (series 3) and the percentage of imports into the U.S. coming from Europe (series 4) testify to great activity, but a number of other series, such as coal output, suggest that though the second half of the 80's was above trend, it was not as prosperous as the first half. National income (series 5) cannot resolve the difficulty, since the series consists of averages for overlapping decades. However, all the important annual series, including agriculture,¹ but with the single exception of exports,² confirm that there was a marked secular fluctuation in the U.S. economy, with 1880-1892 and 1901-1913 above trend, and 1874-1879 and 1893-1900 below trend.³

The fact that prosperity outlasts depression is not without significance. One may be tempted to deny that there is fundamentally a Kuznets cycle, and may prefer to say that all

¹The position of U.S. agriculture is discussed in Section IV below, and shown in Chart VIII, series 36. It was influenced as much by U.K. as by U.S. prosperity.

²Exports in the first half of this period were mainly agricultural, so discussion is reserved to Section IV below. See series 35 in Chart VIII. Exports have a marked secular swing which is the reverse of the swing in the rest of the economy. This represents the effect of the U.K. secular swing.

³The reader should note that in the charts each series has its own vertical scale, so the vertical distances of different series must not be compared directly. Information is given in the Appendix about each series from which the vertical scale can be computed.

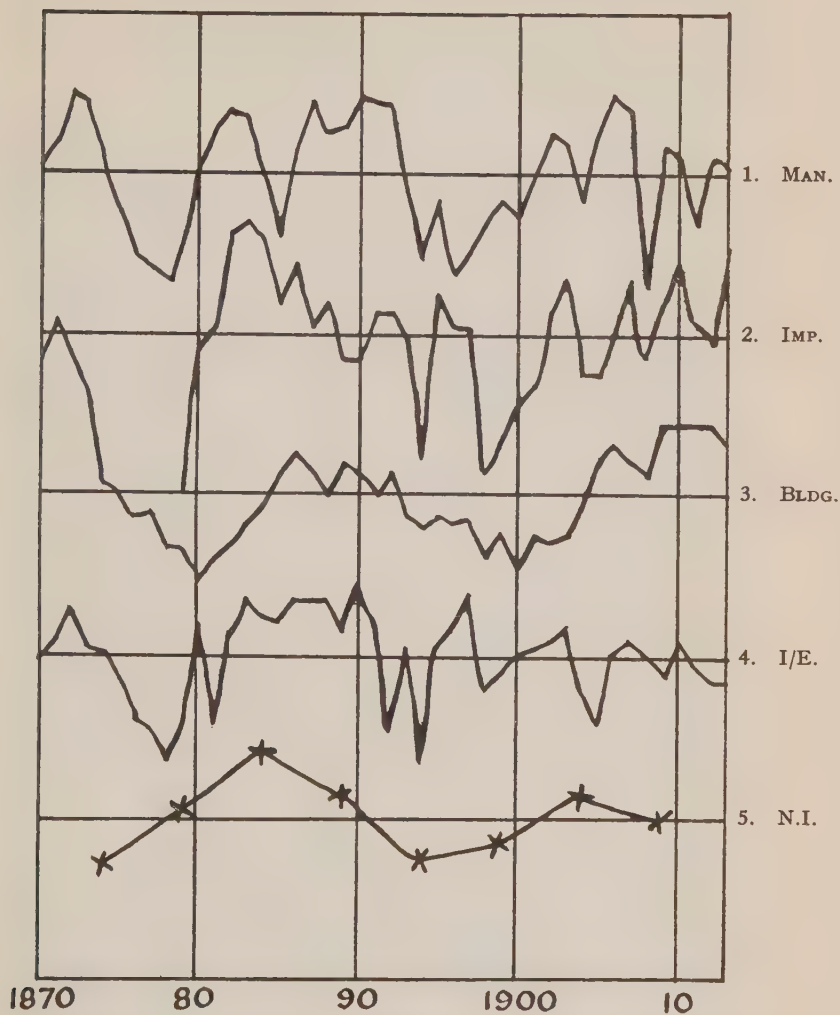


CHART I. U.S.A.

that happens is that once every twenty years one of the Juglar depressions gets out of hand, and lasts for 6 to 8 years, instead of lasting for 1 or 2 years only. Even such regularity as this, however, deserves the name of cycle: there is no reason why the number of years of prosperity and of depression in a cycle should be equal to each other.

The causes of this secular fluctuation—or this propensity to have a runaway Juglar depression every twenty years—are not yet definitely established, and it is not the purpose of this article to establish them. Following Schumpeter's lead, one may pick on the fact that railway construction and immigration show exactly the same periodicity, and may develop the thesis that the economy needs a digestion period to cope with major innovations of these types. Or again, following in the same footsteps, one may pick out the industries which show greatest growth during the upswings, and name each upswing for its major industrial innovation.¹ On the other hand, perhaps the whole thing can be attributed to the building cycle. Since residential building amounts to as much as 20 to 30 per cent. of gross investment in the U.S.A., it would not be surprising that wide secular fluctuations in residential building should produce corresponding fluctuations in the rest of the economy, including other forms of investment. As for the building cycle itself, it is not difficult to explain without resort to the study of innovations. One has only to postulate some stickiness of rents, combined with cobweb-like behaviour on the part of speculative builders, in order to obtain this kind of model.

II. THE U.K.

The U.K. economy did not fluctuate as widely as the U.S. economy because U.K. exports and U.K. home investment moved in the opposite directions. U.K. exports were large, relatively to the economy as a whole, both because the U.K.'s imports were large, and also because the U.K. was a great exporter of capital. In the U.S.A., on the contrary, exports were too small to offset home investment, so the economy had no such stabiliser.

¹This is the line taken by B. Weber and S. J. Handfield-Jones in "Variations in the Rate of Economic Growth in the U.S.A., 1869-1939." *Oxford Economic Papers*, June, 1954.

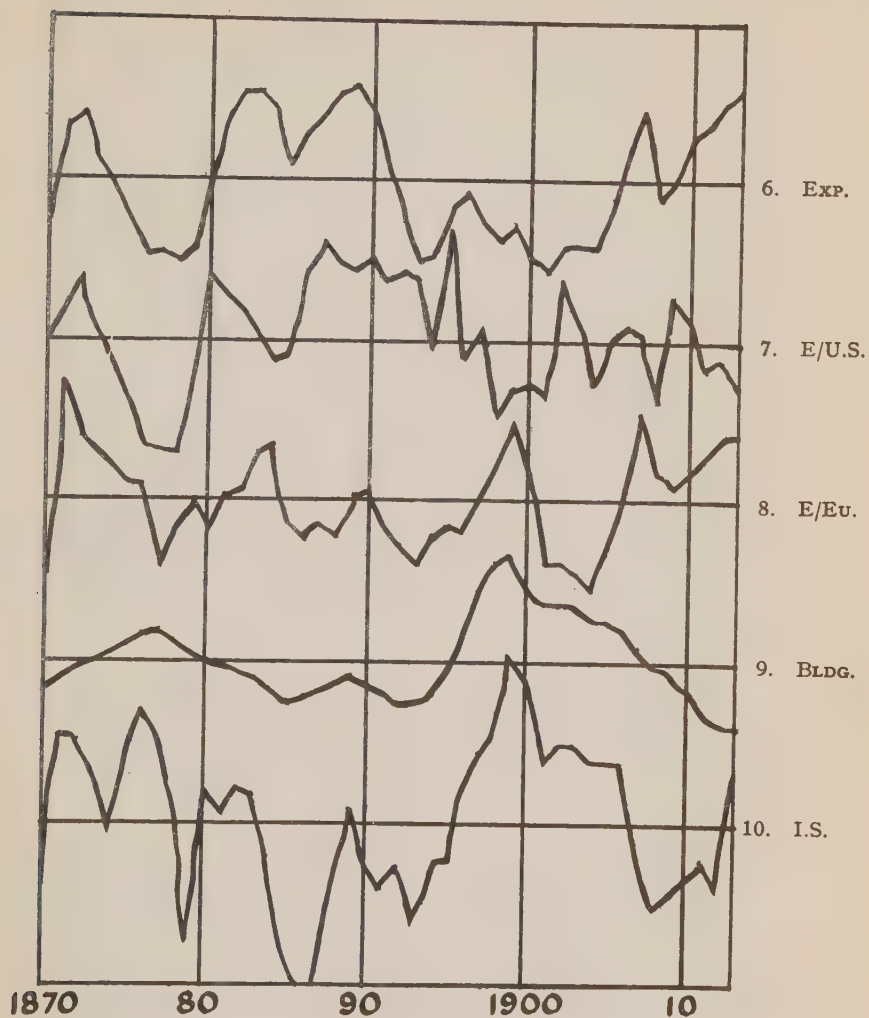


CHART II. U.K.

There was a marked secular swing in U.K. exports, which at least in the first half of the period, virtually coincided with the swing in U.S. manufacturing production.¹ This can be seen by comparing series 6 in Chart II with series 1 in Chart I. That a contributory cause of this U.K. swing was the swing in the U.S. economy is demonstrated by the next two series. Series 7 shows the percentage of U.K. exports going to the U.S.A. (trend removed). (The low level after 1900 is probably due to the effects of the U.S. tariff). Series 8 shows U.K. exports to Europe; this series does not have the same pattern; it parallels instead the behaviour of German exports (series 20 in Chart V), which also went chiefly to Europe. On the other hand, since the U.S.A. was taking only 12 per cent. of the U.K.'s exports in the 1880's, its purchases from the U.K. were not enough to produce such a decisive swing. As we shall see in the next section, Germany was prosperous at the same time as the U.S., and though agricultural Europe and France were depressed in the second half of the 80's, German prosperity will have helped to keep up British exports. Exports to Australia and to Latin America were also above trend in the second half of the 80's, because of the investment boom in those countries, and a similar boom, again financed by capital import, also contributes to the 1905-13 boom in exports.

Series 9 is Cairncross's index of building, and series 10 is his series for home consumption of iron and steel. As in the United States, building and other domestic investment (of which iron and steel consumption is an excellent reflection) go together. Both swing in the opposite direction to exports.

This divergent movement of exports and of investment raises interesting questions. It has often been assumed that fluctuations in exports produced corresponding fluctuations in investment, if only because exports were at this time about one-fifth of the national income, and probably one-third of industrial production. Here the distinction between Juglar and Kuznets cycles is significant. If we were to take a nine-year moving average through the original series, we should find that

¹The low level of U.K. exports in 1900 and immediately after, which is the main difference between series 6 and series 1, was attributed at the time to the effects of the Boer War, which made shipping scarce and reduced foreign borrowing.

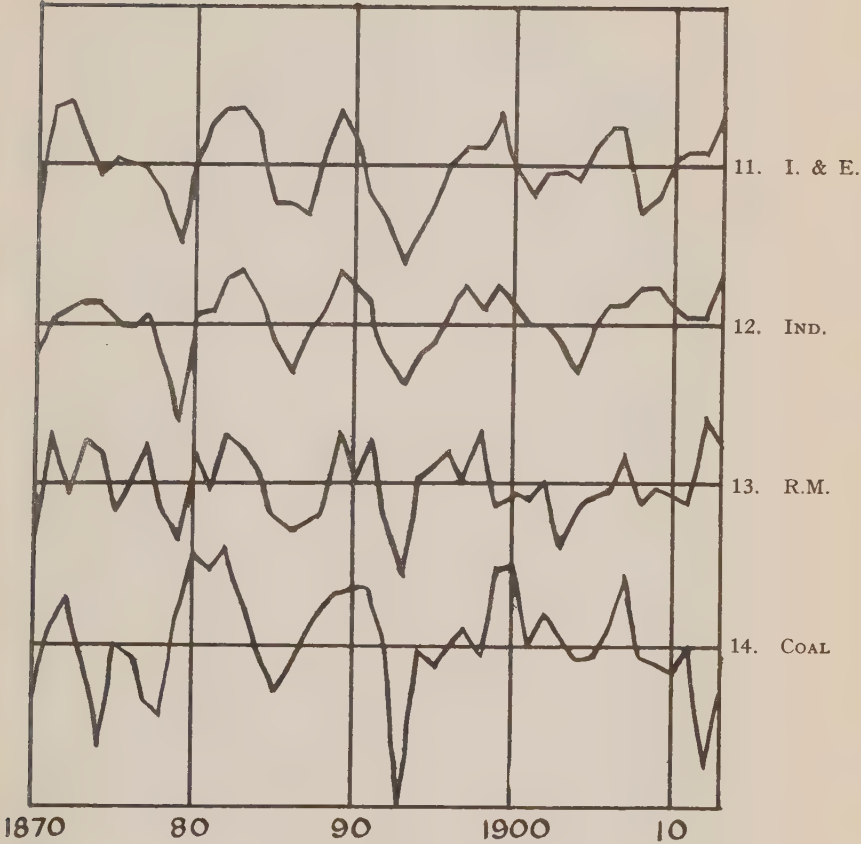


CHART III. U.K.

home investment shows the same Juglar fluctuation as exports ; it is only the Kuznets fluctuation that is different. Again, if one takes a still longer view, the fact that the rate of growth of exports of manufactures dropped from 5.6 per cent. per annum (1820-1860) to 2.1 per cent. per annum after 1870 (1870-1913) is probably causally associated with a similar fall in the rate of growth of industrial production, and with the fall in the proportion of savings invested at home.

Now, although exports were larger than home investment, the secular fluctuations in gross investment were so much wider than those in exports that they offset the fluctuations in exports. The mean deviation of exports from trend was 6.6 per cent., whereas the mean deviation of gross investment from trend was 9.4 per cent. Series 11 in Chart III is the result of adding exports at constant prices and gross investment at constant prices together. It will be observed that the Kuznets swing disappears.

Three other series confirm that exports and home investment offset each other. Series 12 is Hoffman's index of industrial production (without building) ; series 13 is the index of retained imports of industrial raw materials ; and series 14 is an index of domestic consumption of coal (production minus exports and bunkers). All these demonstrate that the wide secular fluctuation in the U.S. economy found no parallel in industrial production in Great Britain.

This is not the same as saying that there was no secular fluctuation in consumption. On the contrary, if production was constant, and there was a secular swing in the terms of trade, this would produce a secular swing in consumption. More important, if industrial production was constant, but there was a Kuznets swing in building, again there would be a Kuznets swing in total output and consumption.¹

¹We do not use a deflated national income series because we do not have an appropriate series for the price of British output with which to deflate it. The prices used by other authors are heavily weighted by the price of imported food, and the secular swing which then results merely reflects the behaviour of the terms of trade. An appropriate price series should have as its largest constituent the price of services, on which information is scanty. It seems also very likely that Mr. A. R. Prest's pioneer national income estimate (*Economic Journal*, March, 1948) seriously underestimates the national income in the early part of the period, since its rate of growth exceeds that of the physical indices which we possess.

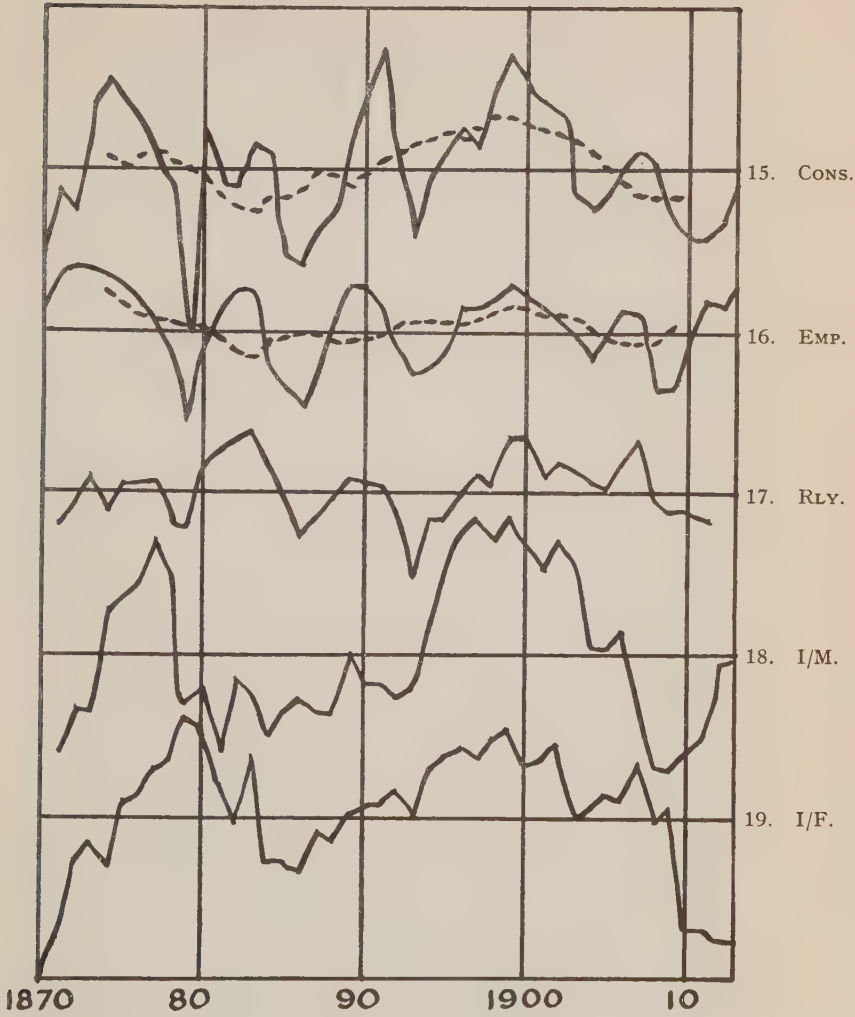


CHART IV. U.K.

That there was a Kuznets swing in consumption can be seen from the series in Chart IV. Series 15 is Tinbergen's index of real consumption of commodities, excluding services (production plus imports minus exports). The swing can be seen more clearly in the nine-year moving average, which is plotted as a dotted line through the series. It is not a wide swing; the nine-year moving average swings from 2.5 per cent. below to 3.3 per cent. above the trend. Exactly the same rather narrow swing can be seen in the trade union index of employment, series 16 (the unemployment percentage reversed; the trend has *not* been removed). But the unemployment percentage is not a good index of secular fluctuations in employment since the percentage of people belonging to trade unions rises in prosperity and falls in depression. There is even clearer evidence of the swing in series 17, which shows the weight of goods carried by the railways.¹

Since industrial production for home consumption was steady,² the swing in consumption has to be accounted for by imports. Imports did in fact have a wide swing; series 18 shows retained imports of manufactures and series 19 retained imports of food. Their swings cannot be explained mainly by the terms of trade. In the first place, if the terms of trade were the explanation, manufactures and food would swing in opposite directions, whereas they swing together. And in the second place, the terms of trade do not swing in this way; for example, they were deteriorating in the second half of the 90's, when these series, on the contrary, were rising rapidly above trend. The obvious explanation is the building cycle (series 9), whose pattern is basically similar. Food imports rise sharply at the end of the 70's despite declining building, because of a succession of bad harvests; and fall more sharply than building in the 1900's, because of deteriorating terms of trade, coupled with a shift from wages to profits. Otherwise, the situation is adequately described by saying that while during these forty years industrial production grew without a secular

¹On closer examination, domestic consumption of coal (series 14 in Chart III) also gives slight supporting evidence of a Kuznets cycle in consumption, with peaks at 1883 and 1899.

²This is deduced from the steadiness of industrial production (series 12) and of home investment plus exports (series 11).

swing, nevertheless, imports and building swing together, and exports swing in the opposite direction.¹ From the point of view of the rest of the world, to whom U.K. imports were the decisive factor, the periods of Kuznets prosperity (*i.e.* above trend) ran from 1875 to 1883, and from 1894 to 1906.

Writers have sought to explain why investment in the U.S. and the U.K. should have fluctuated in opposite directions.² The decades of depression for the U.K. were decades when home investment was low, when the U.S. was booming, and when U.K. foreign investment was high; home investment and foreign investment alternated with each other. Since the U.S.A. was importing capital, it is tempting to argue that the U.S.A. had to fit itself into the U.K. home investment cycle; that is to say, to wait until the U.K. had had a surfeit of home investment, and could spare capital for investment overseas. This line of argument is not very plausible if it is applied to the period from 1870, for while it is true that the U.S.A. was importing capital, its capital imports were so small in relation to its own savings—averaging between 1874 and 1895 less than a half of one per cent. of gross national product³—that it is impossible to hold that capital formation in the

¹There is no support in this material for Professor Phelps-Brown's "Climacteric of the 1890's" (*Oxford Economic Papers*, October, 1952). He bases much of his conclusion on statistics which reflect consumption rather than production (real wages and national income deflated by price series reflecting mainly the cost of living). Series 11, 12 and 13 in Chart III show that industrial production grew as rapidly after 1900 as before. Phelps-Brown's data are per capita, but there was no climacteric in the growth of the industrial population. Anyway, changes in the rate of growth of population at this time were insignificant—fractions of one per cent. per annum—and in the wrong direction from his point of view (steadily growing output divided by decelerating population growth is favourable to calculations of productivity). The series Phelps-Brown presents for individual industries show divergent trends, as we would expect. The fall in the rate of growth of consumption per head after 1900 was due to the building cycle, reinforced by deteriorating terms of trade, and by a shift from wages to profits. There is no need to introduce speculations about the changing nature of innovations. In any case, no explanation of the phenomenon is convincing which assumes that it is unique, and does not take account of similar features twenty years earlier.

²Especially Cairncross, *op. cit.*, and Thomas, *op. cit.*

³U.S. Bureau of the Census, *Historical Statistics of the United States*, p. 242, relying on Bullock, C. J. Williams, J. H., and Tucker, R. S., "The Balance of Trade of the United States," *The Review of Economic Statistics*, July, 1919.

U.S. was at this time dependent on U.K. lending, even when allowance is made for the fact that much of the U.K. capital went into such strategic investments as railway building. The argument is a bit more plausible if it is taken back earlier into the century, say to the thirties and forties. British capital was then perhaps more necessary to U.S. development, and the alternation of the British and U.S. cycles then established may have continued automatically for the rest of the century. Even then it is not very plausible, however, if the U.S. Secretary of the Treasury of the day was right in thinking that foreign investments in the U.S.A. were worth only 222 million dollars in 1853. We have probably to conclude that the U.S. governed its own fortunes in the nineteenth century, and if any adjustment had to be made it was made on the other side of the Atlantic.

May it then be that it was the U.K. which timed its building cycle to fit in with the American? The mechanism in this case would be that British capitalists would invest abroad when the U.S. was prosperous, and return to home investment when the U.S. market slumped. This mechanism is plausible for the period after 1870; but the alternation of the two building cycles goes back much earlier in the century, and it is much less easy to apply this explanation to the earlier period, because of the much smaller importance of foreign investment at that time. If the two economies were linked in this way, the link was not direct but indirect, since most of the British foreign investment did not go to the U.S.A.¹ There is also the possible link through migration, since presumably fewer houses were needed in the U.K. when the U.S. was booming and migration heavy, than when the U.S. was depressed and migration small. But differences in emigration rates made less than a quarter of one per cent. difference to the annual rate of growth of population, so one treats this explanation with suspicion. Besides migration was even less important earlier in the century, when the alternation was already well established (the U.K. building cycle reached peaks in 1825 and 1847, the American in 1836 and 1853). Also, emigration from Germany

¹According to Bullock, Williams and Tucker the U.S.A. imported £200 million of capital from all foreign sources between 1874 and 1895. In this period British capital export amounted to £800 million.

coincided with emigration from Britain, but, as we shall see in a moment, Germany's investment cycle seems to have *coincided* with the U.K. cycle.

We cannot even rule out the possibility that the alternation of the U.S. and U.K. building cycles was a sheer accident, springing perhaps from the different effects which the Napoleonic Wars may have had upon the progress of residential building in the two countries. The case for thinking that it may have been an accident lies in the fact that if the two cycles had coincided, there would have been no mechanism to make them alternate. It would then have been the case that British imports and British exports would have boomed together, and been depressed together. British capital exports would then have been steady, instead of fluctuating widely as a result of booming exports and depressed imports alternating with depressed exports and booming imports. On the other hand, the economy as a whole would have fluctuated more widely. The U.S. economy fluctuated more widely than the British economy because the fluctuations of home investment were not offset by opposite fluctuations of foreign investment, as in the British case. If the two building cycles had coincided, the British economy would have fluctuated as widely as the U.S. economy, in the same direction, and at the same time, and there is no mechanism which would automatically have set to work to counter this, by bringing about opposite fluctuations of the two building cycles. This is what happened in Germany, where capital exports and home investment coincided.

Perhaps this problem will yield to further analysis if we get better figures for foreign investment in the first half of the nineteenth century, and better information on its geographical division. Until we know more precisely to which countries British capital went, and why, we cannot offer definitive explanations of the timing of foreign investment.

III. GERMANY AND FRANCE.

The two economies we have just considered, the U.S. and the U.K., are remarkable for the fact that their internal prosperity fluctuated in the reverse direction to their exports;

this indicating that their prosperity was not dictated by the level of their export trade—at any rate, over the period of the Kuznets cycle. Germany and France, it turns out, were also in this category, so we must deal with them separately before turning to countries whose prosperity depended upon events elsewhere.

The German statistics are presented in Chart V. Before proceeding, we must draw attention to an adjustment we have had to make before using the existing indices. This arises out of the fact that the area covered by German trade statistics was changed in 1872, in 1879, in 1889 and in 1906. The German Empire came into existence in 1872. The Hanse towns, however, did not join the customs union until 1889. From 1872 to 1879 the published totals for German trade involve double counting; from 1880 they exclude the trade of the Hanse towns; then when in 1889 the Hanse towns join the union, recorded imports rise sharply, and recorded exports drop sharply. There still remained certain free port areas, which were not brought into the statistics until 1906, but these affected the position by less than 1 per cent., and can be ignored. We explain in Appendix I how we have overcome these breaks in the statistics (which affect the existing index of industrial production also, in so far as it is based upon import statistics). Since there can be no precision in the methods used, it is fortunate that none of the conclusions which follow depends upon what is assumed to be the correct movement of the figures for 1879 to 1880, and from 1888 to 1889, provided the assumptions are kept within reasonable limits.

Germany's exports depended upon the prosperity of Europe, and thus to some extent of the U.K., but not on the prosperity of the U.S.A. This can be seen by studying the matrix of world trade in 1887 which is presented as Table I. In 1887 the U.S.A. was mainly an importer of manufactures and an exporter of agricultural products. She did little trade with continental Europe. Her European trade was mainly with the U.K., and as the U.K.'s imports did not fluctuate in line with the U.K.'s exports, prosperity in the U.S.A. had little effect on continental Europe.

TABLE I
PERCENTAGE DISTRIBUTION OF WORLD EXPORTS, 1887

From :	To :	U.K.	Germany	U.S.A.	France	Australasia	Other Europe	Asia	Other America	Africa	Unclassified	Total
U.K. ... ..	..	1.2	2.2	1.0	1.5	3.6	3.6	2.5	0.8	0.1	16.5
Germany	2.3	..	1.1	1.0	..	6.9	0.1	0.3	..	..	11.7
U.S.A.	5.6	0.9	..	0.9	0.1	1.4	0.4	1.5	..	0.1	10.9	
France	2.4	1.0	0.8	..	..	3.6	..	1.1	0.6	0.2	9.7
Australasia	1.7	0.1	0.1	0.1	..	..	0.1	..	0.1	..	2.2
Other Europe	6.8	7.9	1.1	4.6	..	7.1	0.4	0.7	0.1	1.6	30.3	
Asia	3.3	0.1	1.0	1.0	0.2	1.3	†	†	†	2.4	9.3	
Other America	1.9	0.3	2.9	1.3	..	0.8	†	†	†	0.2	7.4	
Africa	1.0	..	..	0.6	..	0.3	†	†	†	0.1	2.0
Total	25.0	11.5	9.2	10.5	1.8	25.0	4.6	6.1	1.6	4.7	100.0	

.. = less than 0.05.

† = not known.

The figures in italics are based on import statistics.

Source : See Appendix II.

Continental Europe, excluding France and Germany, exported mainly foodstuffs, and its prosperity was therefore very dependent on the volume of British, French and German imports, and on the terms of trade. Both Britain and France were booming up to 1883, and then depressed for a decade ; during which decade the terms of trade were also very unfavourable to agriculture. Recovery began in the middle 90's, and though British imports were again below trend from 1906 to 1913, the terms of trade were on this occasion favourable, so agricultural Europe remained prosperous until the war.

This is the picture shown by series 20, Germany's exports of industrial products. The great boom in British imports from 1875 to 1883 stands out clearly. Then there is stagnation

from 1884 to 1895, followed by prosperity up to the war. U.K. exports to Europe (series 8 in Chart II) followed more or less the same course ; the Juglar boom of 1889 is low in both cases, but series 8 shows a bigger Juglar depression after 1900 than does series 20.

The series representing internal conditions give an entirely different picture. Series 21 is manufacturing industry, series 22 is imports, and series 23 is railway traffic. They do not agree completely, yet they support each other. They agree that the boom of the second half of the 80's was as powerful as that of the first half of the 80's, despite the depression of exports. The manufacturing series virtually denies that there was a Juglar depression in the middle of the 80's ; and though the other two series both show such a depression, they agree that it was mild and short. Imports and manufacturing agree on the super-boom of the late 90's. Then manufacturing again asserts that the following Juglar depression was mild, and though the other two series do not agree, the imports series at least supports the contention that the year 1906 saw a major break in prosperity.¹

We can justifiably say of the German economy that it was above trend from 1881 to 1890, and again from 1896 to 1907. These are also the dates of the heaviest capital export, except that the capital export boom continued until 1913. This is a remarkable mixture of the British and the American dates ; from 1870 to 1892 the German economy behaves like the American, after which it behaves like the British. The resemblance to the American economy before 1892 is coincidental, but the resemblance to the British economy thereafter has a casual link.

The main explanation of the German Kuznets fluctuation is the German building cycle, which seems virtually to have coincided with the U.S. building cycle, at least between 1870 and 1900. We have not been able to find a series covering the whole period from 1870, but Warren and Pearson ² present a number of charts which suggest peaks in 1873 and 1890, and

¹Estimates of German national income exist, but in the absence of prices for services we are unable to present a real income series.

²*Op. cit.*, p. 123.

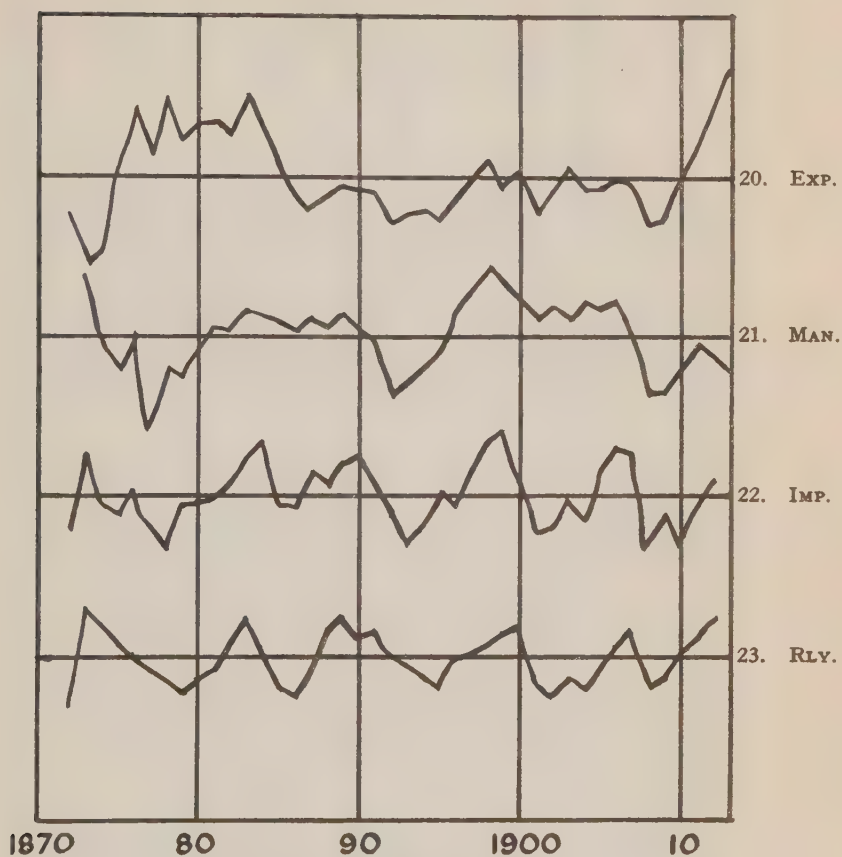


CHART V. GERMANY

Wagenfuhr's figures¹ show another peak in 1904/6 (rather earlier than the U.S.A.). This latter series, which begins in 1890, is specially interesting.

1896	88	1902	115	1908	100
7	95	3	140	9	93
8	103	4	147	10	124
9	115	5	143	1	139
1900	110	6	146	2	125
1	106	7	125	3	100

It shows that if the building cycle had been the only factor, the super-boom would have come not in 1898/9, but in 1906/7. The boom of 1898/9 probably owed something to the super-boom in the British economy, produced by the U.K. home investment cycle, which in turn reflected itself in the super-boom in British imports of food and manufactures (series 18 and 19), and in the resulting prosperity of continental Europe. But it must be admitted that the German export series does not give enthusiastic support to this thesis.

The French picture is again different. French trade statistics for the period before 1914 are notoriously unreliable,² because of lack of care in compiling them. The series for exports, series 24 in Chart VI, should be dominated by U.K. imports, and by the prosperity of agricultural Europe, since, as the matrix shows, these were her chief customers. This would give a super-boom up to 1883, followed by a great depression to 1895, then a super-boom centred on 1899/1900, followed by a tug-of-war between European prosperity and U.K. depression. Instead one gets super-booms in 1889 and 1907, coinciding with super-booms in French capital exports.

In France, as in the three preceding cases, exports and the internal economy do not move together. The internal series show that France had a secular Kuznets fluctuation, with its super-booms in 1883 and 1900. The movement comes out very clearly in a unique French series, showing the horse-power of steam engines installed in industry (stock, not annual additions). This is series 25. Confirmation is supplied by series 26, French

¹*Die Industriewirtschaft*, p. 61.

²See the discussion in H. D. White, *The French International Accounts*, Cambridge, Mass., 1933.

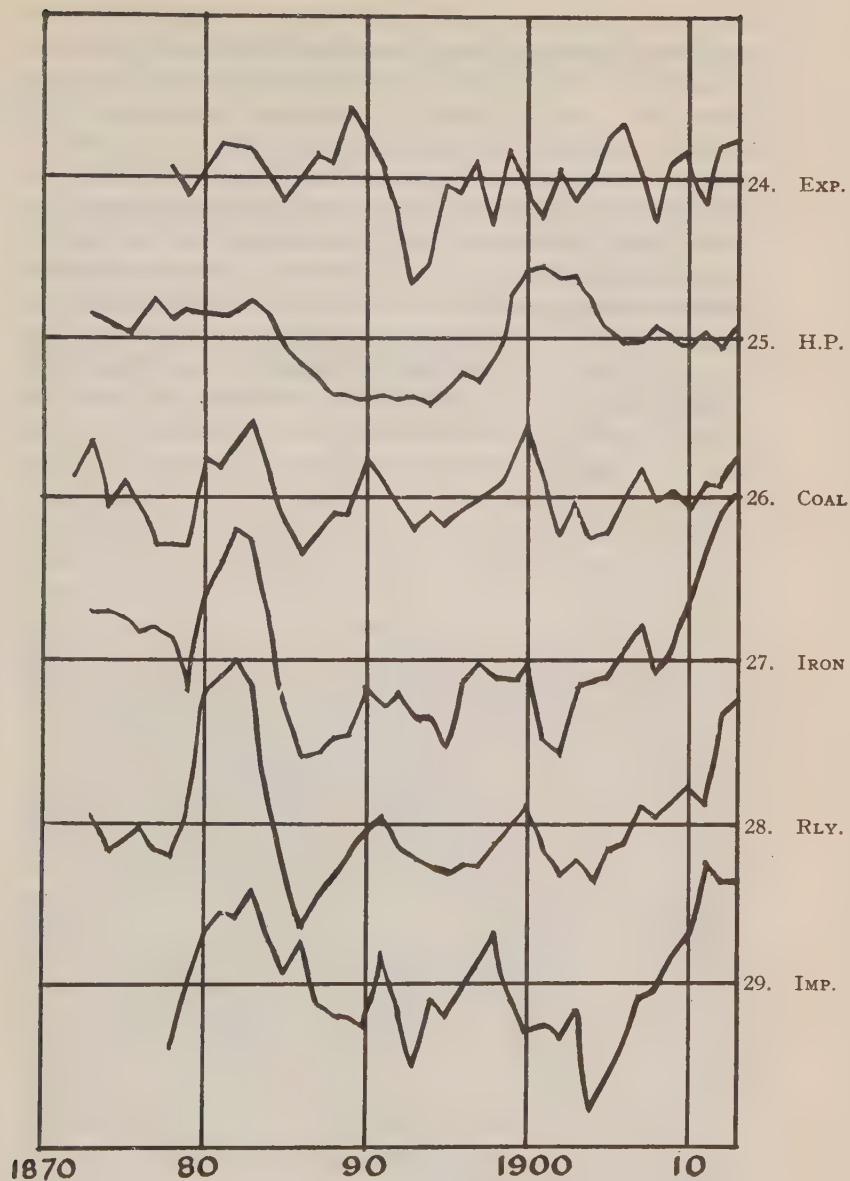


CHART VI. FRANCE

coal consumption (production plus imports minus exports and additions to stocks), which also makes France the only country so far where the depression of 1908 does not bring the series below trend, and is followed by accelerated growth to 1913. Series 27, pig iron production, and series 28, railway traffic, yield the same evidence; so on the whole does series 29, imports, despite its peculiar dating of the Juglar booms and slumps. All these series however emphasise the fact that in France the Kuznets picture is one of sharp peaks, separated by irregular country, rather than the flat plateaus separated by deep gorges which we associate with Germany and the U.S.A.

Alas there is no series for residential building before 1901. The best series we can find is an index number of the output of cement, starting in 1896, which runs as follows : ¹

1896	48	1902	50	1908	70
7	51	3	47	9	71
8	56	4	47	10	79
9	59	5	48	1	93
1900	59	6	65	2	100
1	58	7	65	3	100

This shows peaks in 1900 and 1913, and is confirmed after 1900 by the official index of building. It also corresponds well with series 27, 28 and 29. This correspondence in turn throws some doubt on the behaviour of series 25, the horsepower series, after about 1904. It looks as if the French economy was working up to a new super boom when the war broke out. We cannot say whether France had the normal building cycle, or what its timing was, but if there was such a cycle it was probably not as important as other constituents of the investment cycle. Since population grew only by 7 per cent. in the 35 years from 1876 to 1911, the annual investment in buildings must have been small in relation to national income, and fluctuations in its size cannot have had much effect upon the rest of the economy.

We cannot offer any explanation of the French Kuznets cycle in industrial investment.² Like the British cycle, it

¹*Annuaire Statistique*, 1946, p. 105.

²The depth of the depression of 1884-1895 may have owed something to the *phylloxera*, which was at its worst in those years.

alternated to some extent with a cycle in foreign investment, but the fit is not very good—which is the reason why French output shows a secular fluctuation which does not appear in British industrial production.

IV. AGRICULTURE.

The outcome of the analysis so far is three Kuznets cycles in industrial production in the U.S.A., Germany and France, with corresponding cycles in imports ; and a fourth Kuznets cycle in the U.K., not in industrial production, or in imports of raw materials, but in other production and in other imports. How was the rest of the world affected ?

We note first that these fluctuations could not exactly offset each other, both because their timings did not alternate precisely, and also because the economies differed in size and importance.

The U.S.A. was above trend in the years 1880-1892 and 1901-1913 ; the U.K. in the years 1875-1883 and 1894-1906 ; Germany in the years 1881-1890 and 1896-1907 ; and France had its super-peaks in 1883 and 1900. These dates overlap to give the greatest years of prosperity as 1880-1883 and 1900-1906 ; with the worst period of depression as 1892-1896. What is usually called "The Great Depression 1873 to 1896" should be "The Great Depression 1883 to 1896." The phrase then has meaning for world production as a whole ; but even then it is inapplicable to the U.S.A. and to Germany, and is only of strictly limited application to the U.K.

In Chart VII these dates are confirmed by series 30, world production of raw materials and by series 31, world production of foodstuffs, both of which have a marked secular fluctuation, with roughly the same timing. Exactly the same phenomenon is revealed by the terms of trade between primary products and manufactures, series 32, which when the trend has been removed, reiterates that the great depression began not in 1873 but in 1883, and which remains continuously below trend until 1899.

When we turn from world production to world trade, we cannot expect quite the same picture. The U.S. demand for primary products was small ; she was a net exporter. The U.K.

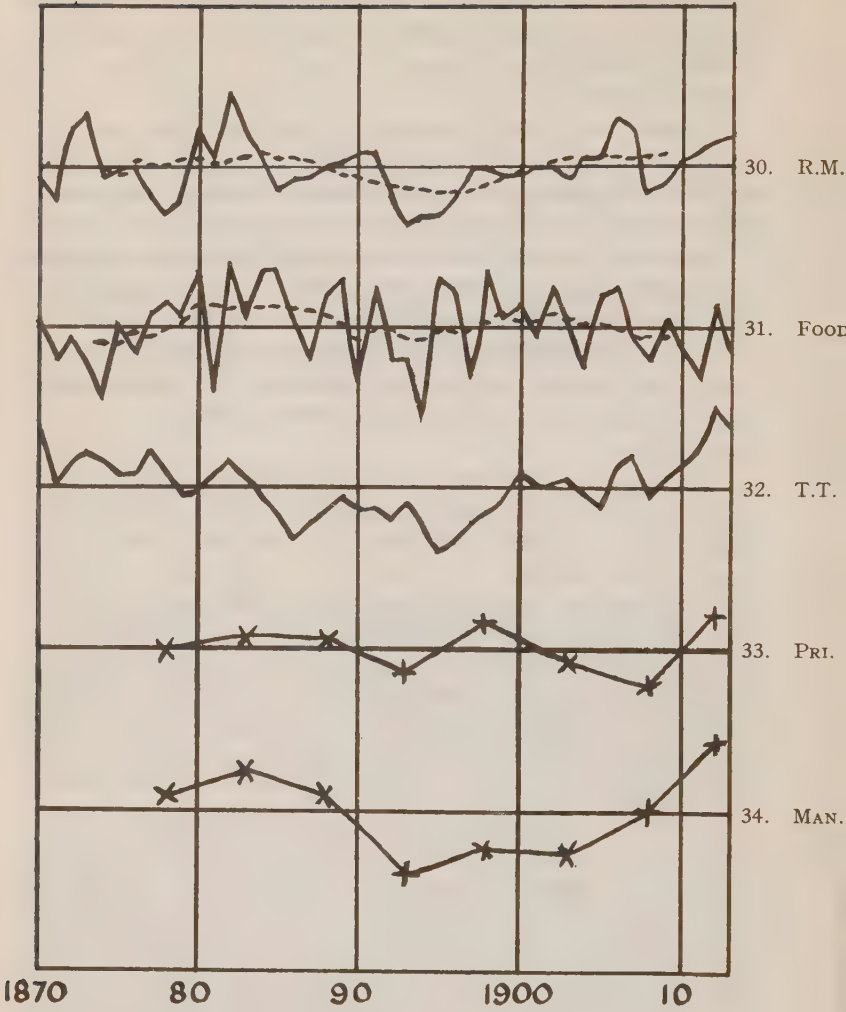


CHART VII. WORLD PRODUCTION AND TRADE

had no secular movement in its imports of raw materials ; here Germany's dates would be dominant, to give a prosperity plateau from 1881 to 1890 and from 1896 to 1907. Whereas, in foodstuffs British imports would set the dominant dates on either side of 1879 and of 1899. We do not have separate series for world trade in food and in raw materials. Primary products together are shown in series 33 (quinquennial averages), which alas starts only in 1876. The influence of Germany and the U.K. is very plain. World trade in manufactures is compounded of the terms of trade and of the volume of trade in primary products ; ¹ series 34 therefore behaves exactly as we would expect it to behave, in the light of series 32 and 33.

When we turn to the agricultural statistics of individual countries, what pattern do we expect to find ? First, we must distinguish exporters of raw materials from exporters of foodstuffs ; the former should have the German-American pattern, with prosperity continuing throughout the 80's, and depression lasting far into the 90's, whereas the latter should have the U.K. pattern, with prosperity disappearing in the middle 80's, and reaching a new peak around 1900.

Secondly, we must distinguish exporters to the U.S.A. from exporters to the U.K. This distinction is not the same as the previous distinction for it applies equally to foodstuffs. For example, exports of tea and exports of coffee should have different secular fluctuations.

Thirdly, we must distinguish exporters sensitive to fluctuations in demand from those who are not. In some countries agricultural output has a very low elasticity of supply ; whether world demand is high or low, roughly the same amount reaches the market from these countries. Others are more sensitive, and so bear the major part of the fluctuations in output corresponding to the fluctuations in demand. As we shall see in a moment, there was a pronounced contrast in this respect between Russia and the U.S.A.

Fourthly, in any country where the elasticity of supply was low, production would be affected more by changes in

¹The relationship is demonstrated statistically in W. A. Lewis, "World Production, Prices and Trade, 1870-1960," *The Manchester School*, May, 1952.

supply conditions than by changes in demand. The most important change in supply conditions was brought about by the building of railways, which increased the areas supplying the world market. Now in the overseas countries the timing of railway building was decided by the timing of capital exports from the U.K. This timing did not coincide with the peaks in the U.K.'s demand for primary products ; on the contrary, it was in the reverse direction. Hence we must not be surprised if we find some countries increasing their agricultural exports most rapidly just when world demand was growing most slowly. This in turn would put a greater strain on those countries whose exports were more sensitive to demand.

We have agricultural series for 9 countries. Of these, two show a Kuznets fluctuation related to demand ; five show Kuznets fluctuations more probably related to the availability of capital imports ; ¹ and two show no secular fluctuation.

We begin in Chart VIII with the U.S.A. Series 35 shows U.S. exports, which at this time were more than half agricultural, and which, in so far as they were agricultural were predominantly to the U.K. The secular fluctuation is extremely wide, and is clearly parallel to that of U.K. imports. It does not correspond to U.S. farm output, shown in series 36. This also was governed by demand, but it was a joint U.S.-U.K. demand. It was the U.K. influence that raised the series above trend as early as 1877, but the U.S. influence that kept it there till 1891. Again it was the U.K. influence that produced the super peak of 1899, and that then brought the series so low just before the war.

The next two series relate to Sweden. We have neither agricultural output nor exports, but we presume that general indexes for an agricultural country reflect mainly agricultural output. Series 37 shows railway traffic in Sweden, and series 38 shows annual investment. Sweden's chief export was timber, and the two pronounced peaks in these series show clearly the

¹This excludes the Canadian and New Zealand series, which are also closely correlated with capital imports. As is explained in our introduction, these series cannot usefully be treated by the technique we are using because their average rate of growth differs between the first half and the second half of the period.

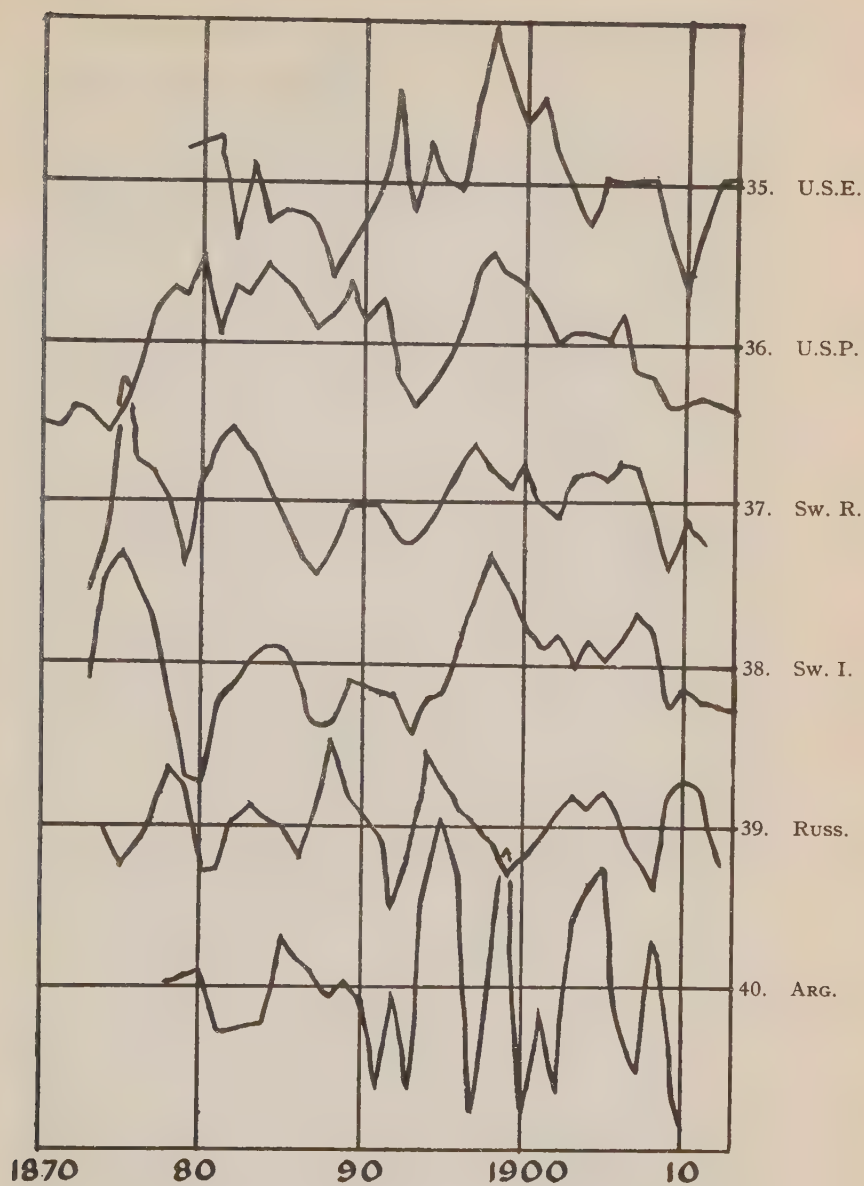


CHART VIII. MISCELLANEOUS

influence of the British building cycle. No other external factor could explain the super-peak of 1875.

Then we come to two series which show no secular fluctuation. Series 39, grain exports from Russia, seems to have fluctuated only with the weather. Series 40 covers most of the exports from Argentina, including livestock products as well as grain. The peculiar behaviour in the middle of the series is due to the growth and decline of the importance of grain exports which fluctuate more widely than wool and hides, which are the important exports when the series starts, and more widely than meat, which comes into increasing prominence at the end. There is no correlation with any Kuznets fluctuation in demand. Neither does the series correlate with railway building, in which there were great bursts of activity from 1883 to 1893, and from 1899 to 1912.

The influence of railway building upon exports can be seen in Australia. Series 41 in Chart IX shows agricultural exports from Australia (excluding animal products), and series 42 shows railway miles added in each year. These two series have the same secular fluctuation, corresponding with U.K. capital exports, and running contrary to the U.K. demand for food. A similar explanation probably accounts for the secular fluctuations in agricultural exports from India, series 43, and in coffee exports from Brazil, series 43, which have much the same pattern, though in the case of Brazil the U.S. demand may already have been the decisive factor. But we do not know why the exports of grain from Roumania, series 44, were so high in the 1890's, or why the exports of silk from China, series 45, grew more rapidly than their trend from 1884 to 1895; in neither case can railway extension be the explanation.

V. REFLECTIONS.

In this concluding section we list a few features which have impressed themselves upon us in the course of this study.

1. First, we have been surprised to discover how widespread the Kuznets cycle is, not only in industrial countries, but in the agricultural countries as well. In the light of this, the fact that there was no Kuznets cycle in U.K. manufacturing output stands out as an oddity; the fact that home and foreign

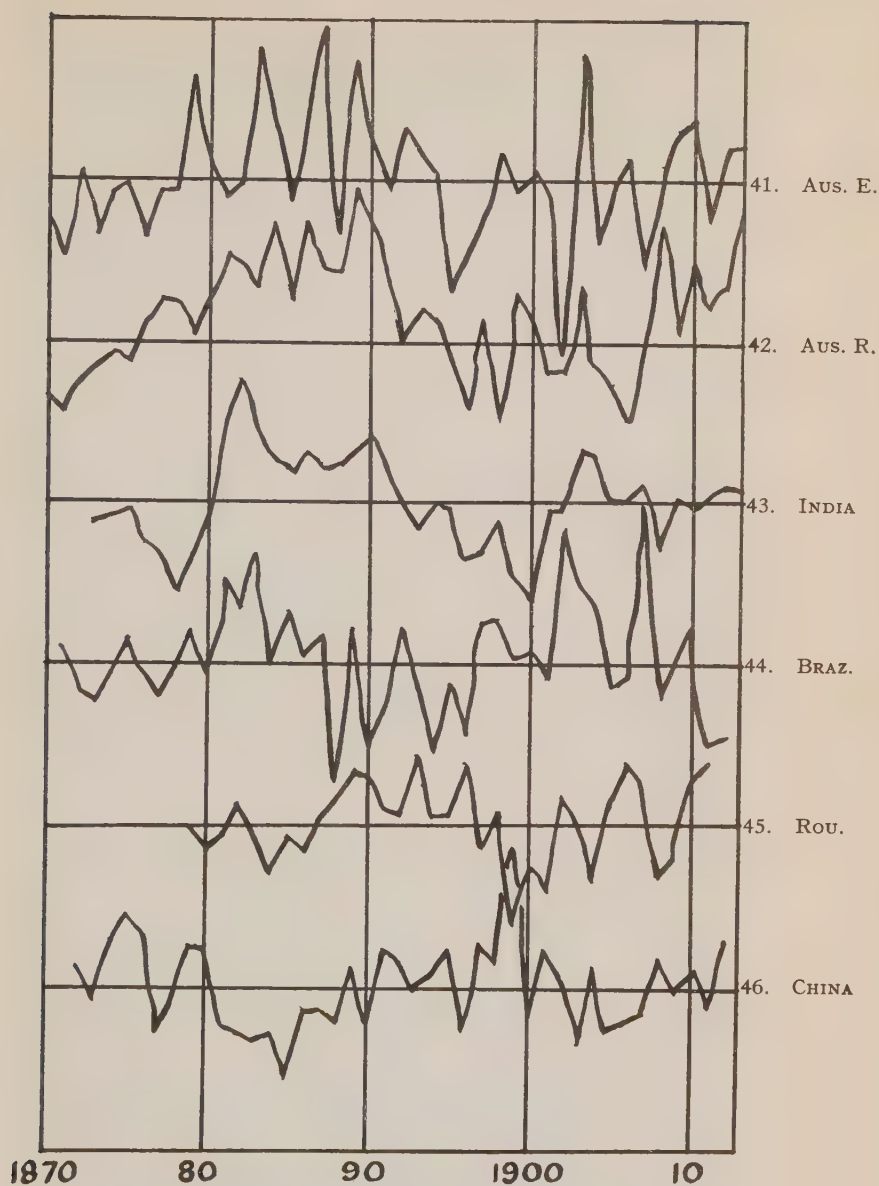


CHART IX, MISCELLANEOUS

investment alternated so closely with each other looks more than ever like a coincidence. The theory that it was produced by some automatic stabilising mechanism is hard to credit in the absence of such a mechanism in the U.S., the German, and other economies which have a marked secular swing.

2. Secondly, the depth and protraction of the Kuznets depressions in Germany starting in 1872, 1890, and 1906 stands out, especially as the phenomenon was repeated again in 1929, when the German depression was worse than that of any other country except the U.S.A. Economists have known for some time about the propensity of the U.S.A. to have these deep Kuznets depressions about once every twenty years,¹—1873, 1892, and signs of a new one just before the first world war—but the existence of the same phenomenon in Germany has not been emphasised before. The German economy had even more reason to fluctuate than the American since—in contrast with the U.K. and the U.S.A., at any rate up to 1906—the periods of heaviest capital export coincided with the periods of heaviest home investment, if the building cycle is a good guide. The coincidence of the U.S.-German timing was not complete—Germany slumped in 1906, while the U.S. continued above trend until the war—and there was probably no causal link, since at this time Germany and the U.S.A. did little business with each other, either in trade, or in international investment.

3. In fact, our third impression is how remarkably independent of each other the four great industrial countries were. Even the dating of their Juglars was not the same. The United States and Germany slumped in 1872 or 1873, but the big slide did not occur in France until 1875, or in Britain until 1877. The slump of 1883 occurred more or less simultaneously. The next slump, however, dates variously from 1889 to 1892; and the slump after that, in 1899, is barely traceable in U.S. statistics. Neither is there continuous leadership; Germany slumped first in 1872, Britain first in 1889, and Germany again first in 1906. The theory that "all slumps come

¹The point was emphasised by Warren and Pearson, *op. cit.*, p. 150, who showed that throughout the nineteenth century protracted depressions came in the U.S.A. regularly about three years after the downturn of the building cycle.

from the United States" cannot be applied before the first world war. The Juglar troughs also do not coincide. Germany and the U.S.A. favour 1878, the U.K. and France 1879. The U.S. favours 1885, the U.K., Germany and France 1886. Germany and the U.K. turn up in 1893, France in 1895, and the U.S.A. in 1896. Germany has her next trough in 1903, the others in 1904. If there were a candidate for leadership into and out of Juglar slumps, it would have to be Germany. But the evidence suggests independence, except perhaps for the great boom of 1899/1900, which seems to have been associated with the high level of British home investment at that date.¹

The most important evidence that these four economies were independent lies in the fact that in each of them the behaviour of the economy as a whole is quite different from the behaviour of exports, on the level of secular fluctuations. In the U.K. and the U.S., exports and the rest of the economy behave in diametrical opposition to each other. The divergence is not so marked in the two other cases ; but Germany continues to be depressed in the second half of the 70's, although exports are booming, continues to be prosperous in the second half of the 80's although exports are depressed, and continues to be depressed after 1910 although exports are booming ; and France shows a similar divergence in the second half of the 80's. The correct conclusion seems to be that each of these four economies was in the grip of a powerful autonomous investment cycle of its own, which outweighed all external influences.

4. The failure of these four autonomous cycles to offset each other completely was of great importance to the rest of the world, and particularly to the terms of trade between industrial and agricultural countries. The timing was good in the 70's ; the peak of the British building cycle coincided with the trough of the American, and prevented the deep U.S. and

¹Some observers were puzzled by the fact that the U.S. recessions of 1949 and of 1953/4 did not coincide with recession in Europe (1952/3). As the above paragraph shows, coincidence of Juglar depressions in the four big industrial countries is the exception rather than the rule. A Kuznets depression in the U.S.A. is bound to cause a draught in Europe, especially when it coincides with a Kuznets depression in Germany (1873, 1892, 1929) ; but Europe can take a Kitchin in its stride, and may not respond immediately even to a Juglar. Much depends on the share of U.S. imports and U.S. capital exports in world trade, which is of course much greater than it was before 1913.

German depression of most of the years from 1873 to 1880 from destroying prosperity everywhere else. The timing was also pretty good in the 80's ; German and U.S. prosperity in the second half did not completely offset the depressions of British and French imports ; but the result was at least better than what followed. For what followed was that the recovery of British home investment was delayed. If the peak of 1877 had been succeeded by another peak in 1895, or even in 1897, the world would have escaped both the great depression of the first half of the 90's, and also the great boom terminating in 1907 ; agricultural prices would neither have fallen so low, nor risen again so high. If there was an automatic mechanism for fitting the investment cycles together, it seems to have broken down after 1890.

5. The relationship between U.S. agriculture and that of the rest of the world seems to have been based upon an interesting automatism. We have seen that, because of the failure of the investment cycles of the great powers to offset each other, there was a pronounced Kuznets fluctuation in world demand and supply of agricultural commodities. We have also seen that individual agricultural countries did not respond to this cycle. Their output grew steadily, like that of Russia, or at a rate determined by the spread of railways, like that of Australia, or in cycles determined by other factors not related to demand. U.S. agricultural output, on the other hand, fluctuated closely with demand, and the deficiency between world demand and supplies from other sources seems to have been made good by a pronounced secular swing in exports from the U.S.A. For example, whereas in the boom period 1896/1900 world trade in primary products averaged only 1·7 per cent. above trend, and U.K. imports averaged only 7·8 per cent. above trend, U.S. exports averaged 19·8 per cent. above trend. U.S. agriculture has continued right down to our own day to play this widely fluctuating role of residual supplier. Its corollary, presumably, is a willingness to carry over long periods much larger stocks of agricultural commodities than any other nation would carry.

6. The fact that railway building was not timed to fit demand is another of the puzzles. The depression of the

agricultural countries began at least as early as 1883 : this can be seen from British exports to Europe (series 8) or German exports (series 20), or from the terms of trade (series 32). But the export of capital from Britain did not rise above trend until 1881, and stayed there until 1890 ; and the same is true of French and German capital exports. In the light of this (and of the coincidence of German home and foreign investment) it is not very plausible to argue that the British and the French invested abroad when overseas investment was profitable, and cut their home investment for the purpose. The supposed link between the terms of trade and foreign investment does not hold for the 1880's, and may therefore have been a mere coincidence in the 1900's. Alternatively, one may argue that foreign investment was a *pis aller*, occurring whenever the home investment cycle was in its trough. This would fit French and British behaviour, both in the 1880's and the 1900's, but it would be hard to square with capital export from Germany, which on this thesis should have been (but was not) larger in the 90's than in the 80's. Again it is plausible to argue that it was the existence of a balance of payments surplus that gave rise to foreign investment, rather than the desire for foreign investment that produced a balance of payments surplus. There was a balance of payments surplus in the U.K. and in France in the 80's, perhaps because American and German prosperity raised their exports, while the downturn of their own domestic investment cycles reduced their imports. Since 1945 we have had plenty of evidence of the fact that the behaviour of the balance of payments may be residual rather than planned. However, the "residual" explanation cannot be exclusive, since the high level of British and French exports in the 80's cannot be explained exclusively in terms of U.S. and German prosperity. In the last analysis one may have to fall back on a psychological argument. Prosperity in the U.S. having started a migration and foreign investment boom, it became fashionable to emigrate to or invest in other overseas countries at the same time, even though these other countries were then depressed. Mob psychology explains the timing of foreign investment better than the terms of trade.

7. Whatever may have been the cause of the secular fluctuation in the export of capital, its effect on the dependent overseas economies was deplorable from their point of view, since it transmitted to them a secular fluctuation in investment and output which was not necessarily even related to demand : on the contrary, their capacity to produce built up most during the prolonged slump in prices from 1883 to 1896. It is not surprising, in view of this, that most of these countries entered the twentieth century determined to become independent of the great powers for money and for markets as rapidly as they could. If there was an automatic mechanism for stabilising the U.K. economy, by its very nature this was a mechanism for destabilising the rest of the world.

8. Finally, it is disturbing to note that the alternation of building cycles which existed throughout the nineteenth century has probably now ended. The U.S., the U.K., Germany and France are all four currently involved in great building booms, and great home investment programmes (correspondingly the export of capital, excluding U.S. aid, is very small when compared with 1910-13 or 1926-28). Presumably all four will therefore have building slumps at about the same time. This has never happened in the past century. At the time of the great U.S.-German slump of 1873, U.K. home investment was just working up to a peak ; in 1892 again the U.K. and France were just about to turn upwards as Germany and the U.S.A. turned downwards ; in 1907 Germany and the U.K. paired in falling low, but France and the U.S. kept well above trend ; in 1929 there were three against one : Germany, France and the U.S.A. had just completed great investment booms, but the U.K. building boom was only just about to begin. What will happen round about 1960 (plus or minus one or two years) if the U.S.A., the U.K., Germany and France then all enter upon building downswings at the same time ?

P. J. O'LEARY.

W. ARTHUR LEWIS.

Manchester.

APPENDIX I

THE STATISTICAL SERIES.

1. **U.S. Manufacturing Production.** Source : E. Frickey, *Production in the United States, 1850-1914*. The trend rate of growth was 5.3 per cent. per annum. The peak at 1882 was 8.0 per cent. above trend.

2. **U.S. Imports of Merchandise at constant prices.** Source : T. J. Kreps, "Import and Export Prices in the United States and the terms of international trade, 1880-1914," *Quarterly Journal of Economics*, 1926, pp. 703-720. The trend rate of growth was 3.5 per cent. per annum. The peak at 1883 was 14.0 per cent. above trend.

3. **New Building, residential and non-residential, in the United States.** Source : C. D. Long, *Building Cycles and the Theory of Investment*, Appendix B, Section 3. The trend rate of growth was 3.6 per cent. per annum. The peak at 1886 was 25.1 per cent. above trend.

4. **Proportion of Imports into the U.S. coming from Europe.** Source : *Annual Statistical Abstract of the United States*. The trend rate of growth was -0.15 per cent. per annum. The peak at 1883 was 6.9 per cent. above trend.

5. **U.S. National Income at 1929 prices, averages for overlapping decades.** Source : S. Kuznets, ed., *Income and Wealth, Series II*. Professor Kuznets draws attention to the fact that the figures shown there for 1869/78 and 1874/83 are too low. They are based on a source which estimated that commodity output doubled in the U.S. between 1869 and 1879. We have recalculated these years as follows :

			1869/78	1874/83	1879/88
Manufacturing	...	...	...57.3	74.6	100
Agriculture	...	...	...70.2	86.0	100
Construction	...	...	...56.3	72.2	100
Commodities	...	...	...63.2	79.7	100
Services	...	...	...63.3	79.4	100
Gross National Product	...	...	63.3	79.6	100

Manufacturing is based on Frickey, *op. cit.* Agriculture is based on F. Strauss and L. H. Bean, cited below (series 36). Construction is given by Kuznets, *op. cit.*, p. 100. The population engaged in services is calculated from two tables in Kuznets, *op. cit.*, pp. 71 and 107, and it is assumed that productivity per man in services increased by 0.75 per cent. p.a. Commodity industries are weighted according to their shares in 1879/88. The trend rate of growth of the revised index was 4.0 per cent. p.a. In 1879/88 the index was 4.2 per cent. above trend.

6. **U.K. Exports of Merchandise at constant prices.** Source : A. H. Imlah, "The Terms of Trade of the United Kingdom, 1798-1913," *The Journal of Economic History*, November, 1950. The trend rate of growth was 2.4 per cent. p.a. The peak at 1883 was 11.0 per cent. above trend.

7. **Percentage of U.K. exports of domestic produce going to the U.S.A.** Source : *Annual Statistical Abstract of the U.K.* The trend rate of growth was -1.8 per cent. p.a. The peak at 1880 was 20.3 per cent. above trend.

8. Exports of merchandise from the U.K. to Europe at constant prices. This is calculated by multiplying total U.K. exports by the percentage going to Europe, using for both series: W. Schlote, *British Overseas Trade from 1700 to the 1930's*, translated by W. H. Chaloner and W. O. Henderson. The trend rate of growth was 1.6 per cent. p.a. The peak at 1884 was 6.9 per cent. above trend.

9. Volume of residential building in Great Britain. Source: A. K. Cairncross, *Home and Foreign Investment, 1870-1913*, p. 157. The trend rate of growth was 1.0 per cent. p.a. The peak at 1877 was 20.0 per cent. above trend.

10. U.K. home consumption of iron and steel. Source: A. K. Cairncross, *op. cit.*, p. 165. The trend rate of growth was 2.3 per cent. p.a. The peak at 1875 was 13.8 per cent. above trend.

11. U.K. home investment plus exports at 1913 prices. Imlah's series of exports (series 6) is converted to 1913 base, where it equals £526 m. Cairncross's building series (series 9) has a value in 1913 of £16.2 m. His home consumption of iron and steel (series 10) is taken to represent all other investment, and given a value in 1913 of £273.8 m. Gross home investment in 1913 is thus taken to be £290 m. The trend rate of growth of this series was 2.3 per cent. p.a. The peak at 1882 was 7.4 per cent. above trend.

12. U.K. Industrial production (excluding building). Source: W. Hoffmann, *Wachstum und Wachstumsformen der englischen Industriewirtschaft von 1700 bis zur Gegenwart*, shortly to be published in English translation by W. H. Chaloner and W. O. Henderson. The trend rate of growth was 1.7 per cent. p.a. The peak at 1883 was 6.9 per cent. above trend.

13. U.K. Retained Imports of Raw Materials at constant prices. Source: Schlote, *op. cit.* Imports less re-exports. The trend rate of growth was 1.9 per cent. p.a. The peak at 1882 was 6.2 per cent. above trend.

14. U.K. Domestic consumption of coal. Imports minus exports and bunkers. Source: a complete series from 1873 appears in *The Colliery Year Book*. The trend rate of growth was 1.4 per cent. p.a. The peak at 1883 was 6.1 per cent. above trend.

15. U.K. consumption of commodities at 1907 prices. This index was constructed by J. Tinbergen, *Business Cycles in the U.K., 1870-1914*. It is based on Hoffman's consumer goods index, Drescher's index of agricultural output, and import and export trade statistics. The trend rate of growth was 1.5 per cent. p.a. The peak at 1891 was 7.2 per cent. above trend.

16. U.K. Percentage of the labour force in employment. This is the unemployment percentage reversed. It is taken here from Beveridge, *Full Employment in a Free Society*. The trend has not been removed from this series. The peak at 1889 represents 98.0 per cent. employment, and the trough at 1886 90.5 per cent. employment.

17. U.K. Weight of goods carried by the Railways. Source: *British Foreign Trade and Industry*, Cd. 4954, 1909. Continued from the *Statistical Abstract*. The trend rate of growth was 2.8 per cent. p.a. The peak at 1882 was 7.5 per cent. above trend.

18. U.K. Retained Imports of Manufactures. Source: Schlote, *op. cit.* Imports less re-exports, at constant prices. The trend rate of growth was 3.6 per cent. p.a. The peak at 1877 was 14.2 per cent. above trend. (It is worthy of note that imports of manufactures increased faster than imports of food or of raw materials).

19. **U.K. Retained Imports of Food.** Source : Schlote, *op. cit.* Imports less re-exports, at constant prices. The trend rate of growth was 3.0 per cent. per annum. The peak at 1879 was 12.6 per cent. above trend.

20. **Germany, Exports of Manufactured Articles, at constant prices.** Source : R. Wagenfuhr, *Die Bedeutung des Aussenmarktes für die deutsche Industriewirtschaft*. Wagenfuhr allows for the break in the German statistics at 1879, but makes inadequate allowance for the break at 1889. For this study we have assumed that German exports increased from 1888 to 1889 by the amount of the trend plus the amount by which the increase in world exports of manufactures exceeded its own trend. Accordingly the figures from 1880 to 1888 have been reduced by 13.5 per cent. The trend rate of growth was 5.3 per cent. p.a. The peak at 1883 was 12.1 per cent. above trend.

21. **Germany, Output of Manufactures.** This is Wagenfuhr's index, with mining and building removed ; the version used here is that given in League of Nations, *Industrialisation and Foreign Trade*. In so far as the index is based upon imports, Wagenfuhr made insufficient allowance for the breaks in German trade statistics in 1879 and 1888. It is here assumed that German production increased at the same rate as railway traffic between 1879 and 1880, and between 1888 and 1889. Accordingly the figures from 1872 to 1879 have been reduced by 12.9 per cent., and the figures from 1880 to 1888 increased by 2.0 per cent. The trend rate of growth was 4.7 per cent. p.a. The peak at 1883 was 4.2 per cent. above trend.

22. **Germany, Imports at constant prices.** Source : the values of German imports have been derived from the U.K. *Annual Statistical Abstract for Foreign Countries*, and deflated by the index of prices of imports into the United Kingdom, as given by Imlah, *op. cit.* This series breaks at 1879 and at 1888. At 1888 it is assumed that imports and railway traffic increased in the same proportion, so the figures for 1880 to 1888 have been increased by 12.2 per cent. This assumption would give unreasonable results at 1879. We have assumed that the peak of 1873 was as much above trend as the peaks of 1890 and 1906, and have accordingly reduced the figures from 1872 to 1879 by 23.3 per cent. The trend rate of growth was 4.5 per cent. The peak at 1884 was 7.9 per cent. above trend.

23. **Germany, Weight of Goods carried by the Railways.** Source : U.K. *Statistical Abstract for Foreign Countries*. The series breaks at 1884, presumably because of railway amalgamations, and shows an enormous drop in weight, although freight receipts and train mileage change very little. It is assumed that weight and mileage altered in the same proportions between 1884 and 1885, so the figures from 1880 to 1884 have been reduced by 24.5 per cent. Figures of weight are not given before 1880, so figures of mileage travelled by goods trains are used from 1872 and linked at 1880. The trend rate of growth was 5.1 per cent. p.a. The peak at 1883 was 5.7 per cent. above trend.

24. **France, Exports of Merchandise at constant prices.** Source : H. D. White, *The French International Accounts*, from 1880. There are price series with which the value of exports can be deflated for earlier years, but as White shows, the method by which they were constructed causes progressive accumulation of error. The series has been carried back two more years, to 1878, by using the price indices given by A. W. Flux, "Price Movements in the Foreign Trade of France," *Journal of the Royal Statistical Society*, 1900. The trend rate of growth was 2.3 per cent. p.a. The peak at 1881 was 4.3 per cent. above trend.

25. **France, Horse-power of steam engines used in industry.** Source : *Annuaire Statistique*, 1946. The trend rate of growth was 5.9 per cent. p.a. The peak at 1883 was 4.6 per cent. above trend.

26. **France, Consumption of coal.** Production plus imports minus exports and additions to stocks. Source : *Annuaire Statistique*, 1946. The trend rate of growth was 2.5 per cent. p.a. The peak at 1883 was 9.5 per cent. above trend.

27. **France, Output of Pig Iron.** Source : *Annuaire Statistique*, 1946. The trend rate of growth was 2.9 per cent. p.a. The peak at 1882 was 25.0 per cent. above trend.

28. **France, Weight of goods carried by the Railways.** Source : *Annuaire Statistique*, 1946. The trend rate of growth was 3.0 per cent. p.a. The peak at 1882 was 20.2 per cent. above trend.

29. **France, Imports of Merchandise at constant prices.** Source : H. D. White, *op. cit.* The series is carried back to 1878 with the price index of A. W. Flux, *op. cit.* The trend rate of growth was 1.4 per cent. p.a. The peak at 1883 was 11.5 per cent. above trend.

30. **World Production of Raw Materials.** This is an unpublished series by the late Carl Snyder, to which he refers in his article, "New Measures of Trade and of Economic Growth," *Revue de l'Institut Internationale de Statistique*, 1934. The trend rate of growth was 4.1 per cent. p.a. The peak at 1882 was 8.5 per cent. above trend.

31. **World Production of Food.** Source : Carl Snyder, *op. cit.* Tobacco is included in this index. The trend rate of growth was 2.5 per cent. p.a. The peak at 1882 was 8.0 per cent. above trend.

32. **Terms of Trade between Manufactures and Primary Products.** An index of the price of raw materials and foodstuffs divided by an index of the price of manufactured articles. Source : W. A. Lewis, "World Production, Prices and Trade 1870-1960," *The Manchester School*, May, 1952. The trend rate of growth was -0.2 per cent. p.a. The peak at 1870 was 8.2 per cent. above trend.

33. **World Trade in Primary Products at constant prices.** These are five-year averages. Source of trade values : League of Nations, *Industrialisation and Foreign Trade*, but the values are deflated not by the price index used there but by the index used by Lewis, *op. cit.* The trend rate of growth was 3.3 per cent. p.a. The average for 1896-1900 was 1.7 per cent. above trend.

34. **World Trade in Manufactures at constant prices.** Five-year averages. Source for values : League of Nations, *Industrialisation and Foreign Trade* ; deflated by price index in Lewis, *op. cit.* The trend rate of growth was 3.0 per cent. p.a. The average for 1881-85 was 6.0 per cent. above trend.

35. **U.S. Exports of Merchandise at constant prices.** Source : T. J. Kreps, *op. cit.* The trend rate of growth was 3.3 per cent. p.a. The peak at 1898 was 39.0 per cent. above trend.

36. **U.S. Farm Production.** Source : F. Strauss and L. H. Bean, *Gross Farm Income and Indices of Farm Production in the United States, 1869-1937*. The trend rate of growth was 2.4 per cent. p.a. The peak at 1880 was 11.3 per cent. above trend.

37. **Sweden, Weight of Goods carried by the Railways.** Source: U.K. *Annual Statistical Abstract for Foreign Countries*. The trend rate of growth was 6.6 per cent. p.a. The peak at 1875 was 22.8 per cent. above trend.

38. **Sweden, Gross Investment at constant prices.** Source: E. Lindahl, E. Dahlgren, and K. Kock, *The National Income of Sweden, 1861-1930*. The trend rate of growth was 5.2 per cent. p.a. The peak at 1875 was 26.7 per cent. above trend.

39. **Russia, Weight of Cereals Exported.** Source: U. K. *Annual Statistical Abstract for Foreign Countries*. The trend rate of growth was 2.6 per cent. p.a. The peak at 1878 was 40.5 per cent. above trend.

40. **Argentina, Exports at constant prices.** Hides, wool, grain, live animals and meat, comprising 87 per cent. of exports by value in 1907, were extracted from the *Annuario del Commercio* and from the U.K. *Annual Statistical Abstract for Foreign Countries*, and added together at constant prices. The trend rate of growth was 5.5 per cent. p.a. The peak at 1885 was 7.4 per cent. above trend.

41. **Australia, Export of Agricultural Products at constant prices, excluding wool and meat.** Source: G. Brandau, *Ernteschwankungen und wirtschaftliche Wechsellagen, 1874-1913*. The trend rate of growth was 4.6 per cent. p.a. The peak at 1879 was 25.6 per cent. above trend.

42. **Australia, Railway Miles added each year.** Source: F. Crowley, printed in Brinley Thomas, *Migration and Economic Growth*, p. 306. The trend rate of growth was 1.1 per cent. p.a. The peak at 1889 was 196.0 per cent. above trend.

43. **India, Agricultural Exports at constant prices.** Source: G. Brandau, *op. cit.* The series consists of coffee, cotton, wheat, rice, jute, oilseeds and tea. The trend rate of growth was 2.5 per cent. p.a. The peak at 1890 was 16.8 per cent. above trend.

44. **Brazil, Exports of Coffee, by weight.** Source: G. Brandau, *op. cit.* The trend rate of growth was 3.8 per cent. p.a. The peak at 1883 was 39.6 per cent. above trend.

45. **Roumania, Exports of cereals.** The weight of exports of barley, maize, rye and wheat was extracted from the U.K. *Annual Statistical Abstract for Foreign Countries*. Wheat was given a weight of 1.5. The trend rate of growth was 2.5 per cent. p.a. The peak at 1882 was 13.5 per cent. above trend.

46. **China, Exports of Raw silk, by weight.** Source: U.K. *Annual Statistical Abstract for Foreign Countries*. The trend rate of growth was 2.0 per cent. p.a. The peak at 1880 was 13.3 per cent. above trend.

APPENDIX II.

THE MATRIX OF WORLD EXPORTS.

The source of these figures is the United Kingdom *Annual Statistical Abstract for Foreign Countries*, which shows the destination of exports and source of imports for each of the leading countries of the world, and total imports and exports for most of the rest. Figures are converted from national currencies at the rate of exchange given in the *Abstract*.

The figures shown for the U.K., Germany, U.S.A., France, Australasia and Other Europe are derived from the exports of these countries. The *Abstract* gives the total exports from the countries of Asia, Other America and Africa, but not their destinations. The allotment to destinations in this table is based on the import statistics of the other countries, after deducting 10 per cent. for freight, etc.

In 1887 Australia was still divided into separate colonies. Their inter-colonial trade is eliminated from Table I. The Hanse Towns were not yet incorporated into the trading system of the German Empire, but their trade is not shown separately here. Instead the exports from Germany to the Hanse Towns are included in the total exports of Germany, and are assumed to have been re-exported to destinations in the same proportions as other German exports. Apart from these two adjustments, there has been no other elimination of infra-continental trade.

Austria-Hungary did not begin to show the destination of exports until 1891; it is assumed that the geographical distribution of exports was the same in 1887 as in 1891.

The unclassified item in the trade of Other Europe is the trade of Turkey, Greece, Bulgaria and Serbia, for which the *Abstract* does not show the destinations. The unclassified item in the trade of Asia is the difference between total exports and what is identified in import statistics; probably most of this is inter-Asian trade.

The figures are in most cases "Special Trade" (i.e. they exclude re-exports). The total value in 1887 was £1,347,000,000.

The Development of Agricultural Production in Great Britain and Ireland from the early Nineteenth Century

(Index of Agricultural Production)

[The following article, in which Dr. Leo Drescher calculated an index of agricultural production for the United Kingdom, was originally published as *Die Entwicklung der Agrarproduktion Grossbritanniens und Irlands seit Beginn des 19en Jahrhunderts. Bemerkungen zum Index der Agrarproduktion* in the periodical *Weltwirtschaftliches Archiv*, Vol. XLI (Part 1) (1935), pp. 270-94. The article has been translated by W. O. Henderson and W. H. Chaloner and permission to print an English version has been given by Dr. A. Zottmann of the *Institut für Weltwirtschaft* at the University of Kiel. For many years Drescher's pioneer index of agricultural production was the only such index available to students of economics and economic history. Although Drescher's index has now, to a great extent, been superseded by that of Ojala, it appears desirable that the article in which it originally appeared should be available in English since a number of writers on economics and economic history have made use of this index. The text of the article and the statistical tables have been reproduced in full but only two of the ten graphs in the original paper have been printed in this translation. Virtually all the information given in the graphs that have been omitted is to be found in the tables. A critical note on Drescher's estimates by T. W. Fletcher appears at the end of the article.]

The United Kingdom cannot be regarded as an economic unit from the point of view of agricultural production.¹ An obvious distinction must be made between Great Britain and Ireland. While in Great Britain—particularly in England and Wales—the industrial sector of the economy became of decisive importance in the early years of the nineteenth century, Ireland has to this day maintained a predominantly agrarian economy. Consequently, various branches of agriculture developed in quite a different way in Great Britain and in Ireland. In addition there have also always been significant differences between the systems of land tenure in the two islands. Erroneous conclusions could easily be drawn from an index of agricultural production which covered the whole of the United Kingdom. The construction of two indices is also desirable owing to the nature of the statistical returns of the

¹Dr. Drescher appears to have used the terms *Produktion* and *Erzeugung* (or *Erzeugniss*) as synonyms. Both words have generally been translated by the word "production."

two regions. Since Ireland had a predominantly agrarian economy throughout the nineteenth century agricultural statistics were issued at an earlier date than in Great Britain. The Irish official returns begin in 1847 but the British returns date only from 1866.

Agricultural production can be estimated from two types of returns :

- (i) Statistics of acreage under cultivation and livestock ;
- (ii) Statistics of production (arable and livestock production).

For our purpose the second set of statistics—of arable and livestock production—are of primary importance. The returns of acreage and of livestock need be used only as auxiliary material. Returns of acreage (and output per acre) enable us to check figures of crop output while returns of the number of livestock, the dead-weight of beasts and of milk output per head, enable us to check figures of livestock production.

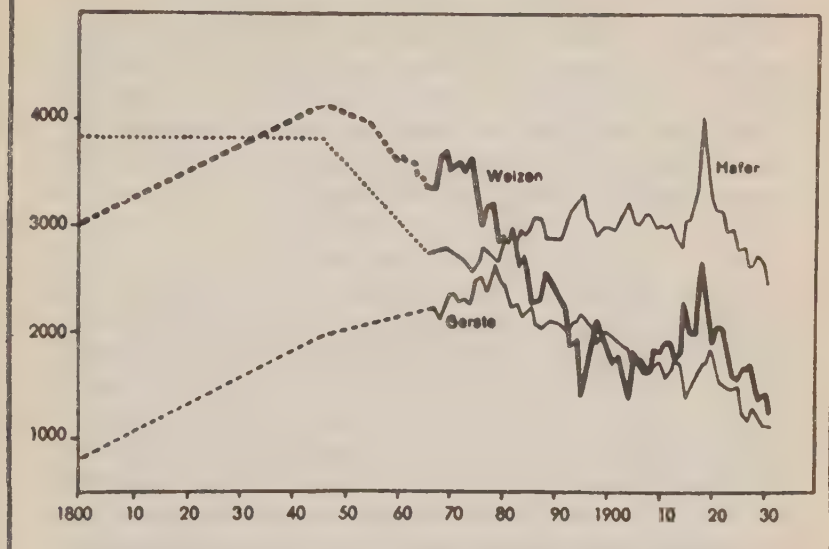
I. ACREAGE AND LIVESTOCK.

Since British official agricultural statistics begin only in 1866¹ it is almost impossible to estimate agricultural production for the first two-thirds of the nineteenth century. There are isolated estimates of the amount of land under cereals for the years 1812, 1846 and 1854.² Since these estimates do not differ very much from later official figures we have used them in our calculations. In order to make an estimate of the amount of land under wheat, oats and barley between 1800 and 1866 we have interpolated the estimates for 1812, 1846 and 1854 as dotted straight lines in Graph I. This graph shows that the

¹The official statistics of acreage and livestock are to be found in the following publications :—For Great Britain—*Agricultural Statistics* (now issued by the Ministry of Agriculture and Fisheries), Vol. I (1867) to Vol. 68 (1933-34). For Ireland—*Agricultural Statistics 1847-1926, Report and Tables* (compiled by the Department of Industry and Commerce) (Stationery Office, Dublin, 1930). After 1921 the agricultural statistics of Northern Ireland were compiled separately from those of Eire. We have not included figures for Northern Ireland in our estimates for either Great Britain or Ireland. Northern Ireland's share of the agricultural acreage and livestock of the United Kingdom is never more than 9% of the total. Moreover the agricultural statistics of Northern Ireland are incomplete.

²See below Appendix, Table I.

SCHAUBILD 1. — ANBAUFLÄCHE VON GETREIDE IN GROSSBRITANNIEN
1800-1931 (in 1000 acres)



Land under Cereals in Great Britain (in 1,000 acres), 1800-1931

Weizen	=	Wheat
Hafer	=	Oats
Gerste	=	Barley

early estimates for the land under wheat and oats are higher than the official statistics available after 1866. The early estimates for barley, on the other hand, are lower. This result is in accordance with what is known of the development of British farming in this period and suggests that the early estimates are reasonably reliable.

The acreage under vegetables¹ and clover and fallow can be estimated in the same way. But early estimates for these acreages are less reliable than those for cereals since each estimate covers a rather different range of products. Sometimes the estimates for leguminous plants include rye² while

¹Drescher refers to (a) *Hackfrüchte*—vegetables which require hoeing (e.g. potatoes, turnips and cabbages), and (b) *Hülsenfrüchte*—leguminous plants (e.g. peas and beans).

²The word *Roggen* in the original may perhaps be an error. *Raigras* or *Haargras* (ryegrass) would probably be more correct.

estimates for clover may include some grassland. Moreover a general estimate for vegetables that require hoeing may not differentiate clearly between potatoes, turnips, cabbages and so forth.

Early estimates of the numbers of livestock are least reliable since they differ considerably from later official statistics. We have ignored these estimates and have relied solely upon the later returns. Agricultural statistics for Ireland are available from 1847 onwards. Earlier Irish estimates for acreage and livestock are unreliable.

II. PRODUCTION.

Irish statistics are also available from 1847 onwards for production per acre of arable crops, such as cereals, potatoes, turnips, etc. Similar statistics for Great Britain are available only in and after 1884. Between 1866 and 1884 the official British agricultural statistics did not include estimates of production per acre. But there are unofficial estimates of the output of wheat per acre in Great Britain from 1849 onwards.¹ There are also valuable unofficial estimates for the production of wheat per acre in England and Wales for the years 1817-28.²

In order to make an approximate estimate of other British arable yields per acre before 1866 we have used the Irish figures for Great Britain. In making an estimate for 1866-84 we have assumed that the relationship between Irish and British yields was much the same in that period as in 1884-1900 (when returns both for Great Britain and Ireland are available). Our detailed estimates for British arable yields therefore date from 1866 while those for Ireland go back to 1847.

There are isolated estimates of the yield as well as the acreage of the three main British cereals—wheat, oats, barley—

¹*Journal of the Statistical Society* (London), Vol. 42 (1879), p. 783. [See also M. K. Bennett, 'British wheat yield per acre for seven centuries' (*Economic History*, Vol. III, no. 10, Feb. 1935, pp. 12-29).]

²W. Jacob, *Report on the Trade in Foreign Corn* . . . (London, 1826) ; W. Jacob, *Tracts relating to the Corn Trade and Corn Laws* . . . (London, 1828)—see Tract I : "Report . . . respecting the agriculture and the trade in corn in some of the Continental states of Northern Europe," dated 16th March, 1828. Extracts from these reports are printed in T. Tooke and W. Newmarch, *A History of Prices* . . . (6 vols., 1838-57 ; facsimile reprint 1928), Vol. V, pp. 98-106 and table on p. 103.

for the first half of the nineteenth century.¹ It is unfortunately not clear whether these are average yields (over a number of years) or yields for particular years. If we indicate by a straight line on a graph the trend of the yields for Great Britain between 1855 and 1870 and then extend this line back to 1800 we find that the yields obtained from early unofficial estimates fall on, or close to, this line. Barley, however, is an exception because the early estimates suggest that the output was higher than in 1855-70. It cannot be assumed that the yield of barley was higher at the beginning than in the middle of the nineteenth century. It is probable that the trend of barley output was much the same as that of oats. The two harvests were often at about the same level. We have based our calculations of the trend of output on the period 1855-1870 and not on the middle years of the nineteenth century because arable production was exceptionally high in the 1850s. That was a period of "high farming" and good harvests. The yields of the 1850s cannot be regarded as typical of the whole century. By using these estimates of acreage and yield it is possible to estimate the production of cereals for the first half of the nineteenth century.

The production of wheat may be estimated in another way. G. R. Porter calculated that the consumption of wheat amounted to 7 bushels per head.² If this figure is multiplied by the total population the total consumption of wheat may be ascertained. If the net import of wheat is deducted from this figure the home output may be discovered. An estimate made in this way for 1817-28 corresponds very closely to W. Jacob's estimate.³ In the circumstances we feel justified in basing our estimate of wheat output on consumption figures rather than on figures calculated from acreage and yield per acre. But in estimating the production of barley and oats the calculation is based upon acreage and yield. This method has been used because only a part of the production of these two cereals is

¹See Appendix, Table II.

²G. R. Porter, *The Progress of the Nation . . .* (new edn., 1851), p. 143. Porter stated that the consumption of wheat was between 6 bushels and 8 bushels per head. We have used 7 bushels as our estimate since this coincides most closely with W. Jacob's estimate for 1817-28.

³W. Jacob, *op. cit.*, and T. Tooke and W. Newmarch, *op. cit.*

consumed by human beings. It is not possible to estimate total production on a basis of consumption.

It is still more difficult to estimate livestock production. The only reliable estimates are those concerning the numbers of cattle, sheep and pigs in the country. Estimates of meat production, the numbers of livestock slaughtered, the weights of livestock slaughtered and the output of milk are all of a rather rough-and-ready character. The estimates of the Committee of the Royal Statistical Society enable us to calculate the percentage of livestock slaughtered per annum. Our calculation is based on the assumption that as agriculture progresses this percentage will increase.

NUMBER OF LIVESTOCK (CATTLE, PIGS AND SHEEP)
SLAUGHTERED (PER ANNUM) IN GREAT BRITAIN
(AS % OF TOTAL NUMBER OF LIVESTOCK) ¹

Period	Cattle	Period	Pigs	Period	Sheep
		1850-1860	116		
1860	24	1860-1870	117		
1860-1880	25	1870-1880	118	1860	35
1880-1900	26	1880-1890	119	1860-1880	36
1900-1930	27	1890-1900	120	1880-1900	37
		1900-1930	121	1900-1930	38

In any calculation of the number of cattle and sheep brought to market for slaughter it is necessary to estimate how many calves and lambs are included in the totals. The Committee of the Royal Statistical Society estimated that 30% of the cattle were calves and that 20% of the sheep were lambs.²

Just as the percentage of cattle, sheep and pigs brought to market for slaughter did not remain constant in the nineteenth century so the average weight of the slaughtered beasts changed during this period. The average weight increased owing to improvements in farming technique such as the use of better feeding stuffs. The earliest estimates of average carcase weight were made between 1865 and 1870.³ The highest estimates

¹*Journal of the Royal Statistical Society*, Vol. 46 (1883), p. 25 *et seq.* and Vol. 67 (1907), p. 368 *et seq.* and p. 413 *et seq.*

²*Journal of the Royal Statistical Society*, Vol. 67 (1904), p. 371 and p. 373.

³See Appendix, Table III.

were those for 1908. The estimates for 1925 were lower than for 1908. It must be assumed that the poor feeding of cattle and sheep during the first World War led to a fall in average carcase weight. The decline presumably began in 1915 and continued until 1918. There was no immediate recovery after the end of the first World War and it is not unreasonable to assume that the low figure for 1925 applied also to the period immediately before that date. Still later estimates for 1930-31 ¹ stated that the average weights of carcasses remained about the same as in 1925, but our own calculations ² suggest that by the early 1930s the difficulties of the war and post-war years had been overcome and that the average weights for 1908 had again been reached.

It has been assumed that little or no decline occurred in the weight of pig carcasses during and immediately after the first World War since the average weight was given as 160 lb. both in 1908 and 1925 and this seems a rather low estimate. For similar reasons it has been assumed that no decline occurred in 1914-18 in the weight of lambs. The output of milk in 1908 cannot be compared with that of 1925 ³ as different methods were used to estimate production. We have assumed that the output of milk was the same in these two years. There was a slight decline in milk production during the first World War which has been estimated at about 11% (a drop in output from 135 million gallons to 120 million gallons).⁴ On the basis of the various estimates we now calculate the total livestock production (excluding wool) which—in contrast to crop production—can only be regarded as a rough approximation even for the period from 1866 to 1930. The figures for the production of meat and milk from every 1,000 head of live cattle in England and Wales have also been used to calculate the livestock production of the United Kingdom.

Estimates of livestock production in Britain can be checked from statistics of the total output of meat which exist from

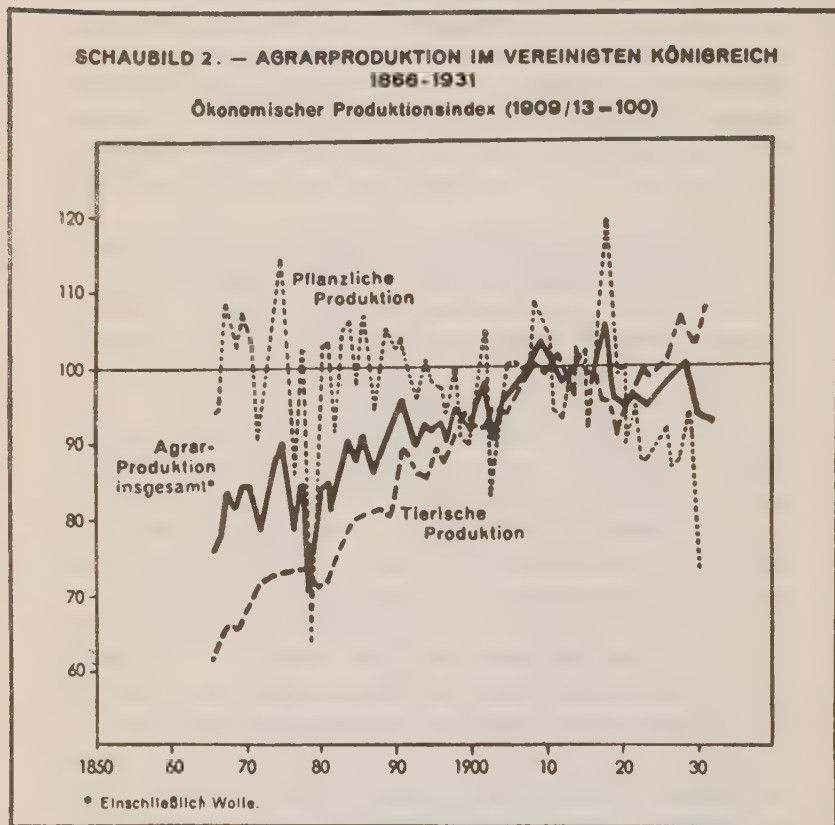
¹*The Agricultural Output of England and Wales, 1930-1931* (Cmd. 4605 of 1934).

²See Appendix, Table V.

³*The Agricultural Output of England and Wales, 1925* (Cmd. 2815 of 1927), p. 63.

⁴The decline in the average carcase weight of cattle slaughtered was about 6%.

1901 onwards. These figures are about 9% lower than our own estimates.¹ The check is however incomplete since there is no series of statistics of milk output for the period 1900-30 which can be compared with our estimates. For the years 1925 and 1930-1 it is however possible to check our estimates by official



GRAPH 2

Agricultural Production of the United Kingdom, 1866-1931 :
Economic Production Index (1909-13 = 100)

Pflanzliche Produktion	=	Arable Production
Agrar-Produktion insgesamt	=	Total Agricultural Production.
Tierische Produktion	=	Livestock Production.
Einschliesslich Wolle	=	Including Wool.

¹See Appendix, Table IV.

estimates¹ of milk and meat production. There is a fair correspondence between the two estimates—bearing in mind the fact that the calculations are made in different ways. For 1925 the official estimate (1,285,200 tons starch equivalent)² is only 4.5% lower than our own (1,345,600 tons starch equivalent). For 1930-31 there is an even closer correspondence since the difference between the two estimates is only 3.5%. But differences between separate items are greater. In 1925 the official estimate for meat production is 16.2% higher than on our own, while for milk production the official estimate is 14.5% below ours. For 1930-1, on the other hand, the official estimate for meat production is only 1.15% higher than our own while the official estimate for milk production is 6% below our figure.³

It is not possible to make a strictly accurate check of our estimates with those of the official census of agricultural production since this involves comparing calendar years with harvest years. The official output figures for milk between 1924-5 and 1930-1 are only estimates based on the assumption that there was a steady annual increase in the yield of milk per cow in these years.⁴ Since the output of meat between 1924-5 and 1930-1 is known it is possible to compare the two methods of calculation for this five-year period and so remove possible errors. The result of this check, too, is very satisfactory since there is little difference between the two estimates. Taking the output of meat and milk together there is a difference of less than 5% and we have not considered it necessary to adjust our own figures.

In and after 1850 estimates for wool production are available. Those for 1850-99 were made by H. Schwartze & Co. of London⁵ and consist of estimates for the amount of raw wool

¹*The Agricultural Output of England and Wales, 1925* (Cmd. 2815 of 1927) and the *Agricultural Output of England and Wales, 1930-31* (Cmd. 4605 of 1934).

²For starch equivalent, see below.

³See Appendix, Table V.

⁴*Agricultural Statistics*, Vol. 67 (1932), Part I, p. 48.

⁵Quoted by W. Senkel, *Wollproduktion und Wollhandel im XIX^{ten} Jahrhundert mit besonderer Berücksichtigung Deutschlands* (*Zeitschrift für die gesamte Staatswissenschaft*, Supplementary Volume II) (Tübingen, 1901), p. 22.

coming on to the market. As wool production is of little significance in Ireland we have made an estimate only for Great Britain.

III. CALCULATION OF INDEX OF PRODUCTION.

1. *Physical and Economic Indices of Production.*

There are two methods of calculating an index of agricultural production. Two weights could be used—(i) nutritional value expressed as calories or starch-equivalent, (ii) prices.

It has been decided to use nutritional values for weighting purposes. The modern scientific study of human foods and animal feeding stuffs has made it possible to compare different foods and feeding stuffs according to their nutritional value. For human foods the unit of nutritional value is the calorie; for animals it is the "starch equivalent." The nutritional value of all feeding stuffs is expressed in "starch equivalents" in accordance with the Kellner method.¹ The "starch equivalents" are a measure of the physiological value of feeding stuffs.

The conception of "starch equivalents" is based upon the assumption that in animals neither albumen nor fat are absolutely essential for increasing weight (in the form of fat or muscle). Concentrated feeding stuffs free from nitrogen alone make possible the growth of fat and muscle. Kellner has calculated the nutritional value of 100 kg. of all feeding stuffs in terms of digestible starch meal. This nutritional value is called the "starch equivalent." Thus a portion of digested fat (seed cake) is estimated to have a "starch equivalent" of 2.41. Kellner's "starch equivalent" can easily be turned into calories by using Fingerling's formula (1 kg. "starch equivalent" = 183 calories).² The nutritional value of animal carcasses—like other foods consumed by human beings—is generally expressed in calories but can also be expressed in "starch equivalents."³

¹O. Kellner, *Die Ernährung der landwirtschaftlichen Nutztiere. Lehrbuch auf der Grundlage physiologischer Forschung und praktischer Erfahrung* (10th edn., ed. by G. Fingerling), Berlin, 1924.

²J. Hansen (ed.), *Handbuch der Landwirtschaft*, Vol. IV, *Allgemeine Tierzuchtlehre* (Berlin, 1929): see G. Fingerling's section on "Die Ernährung der landwirtschaftlichen Haustiere" (p. 168, *et seq.*)

³R. Höber, *Lehrbuch der Physiologie des Menschen* (4th edn., Berlin, 1928), p. 192.

By using this technique the nutritional value of all the principal foods produced by agriculture can be expressed in a common measure. The use of "starch equivalents" as a unit of measurement enables us to assess the food produced on the farms more accurately than by any other method. There are circumstances in which the ability to estimate accurately the capacity of agriculture to produce food is of considerable importance—as in the case of a country with limited agricultural resources. We use the term "Physical Index of Production" to denote the index of production calculated on the basis of "starch equivalents." We use the term "Economic Index of Production" to denote the index of production calculated on the basis of prices. It will be seen later that there is a close correspondence between these two indices of output.

2. *Indices of Production.*

The following indices represent total agricultural production. Estimates for the production of wheat, barley and oats have been made from 1800 onwards. The output of other products is based on statistics and estimates that begin in 1847 for Ireland and for 1866 for Great Britain.

I. *Arable Production.*

(a) *Cereals.*

- | | |
|-----------------------|-----------|
| 1. Wheat | 3. Barley |
| 2. Rye (Ireland only) | 4. Oats |

(b) *Roots.*

- | | |
|-------------|-------------|
| 5. Potatoes | 7. Mangolds |
| 6. Turnips | |

(c) *Leguminous Plants.*

- | | |
|----------|---------|
| 8. Beans | 9. Peas |
|----------|---------|

II. *Livestock Production.*

10. Meat (beef, pork, mutton)
11. Milk
12. Wool

The production of fruit, vegetables, eggs, and poultry is excluded since they represent a relatively small proportion of the total value of agricultural production.

It is necessary to consider to what extent the various items included in our index of production may be regarded as accurately representing total agricultural production.

Value. The value of agricultural production is based on official estimates of the value of farm and market garden produce brought to market or consumed on farms (1925).¹ These returns are for England and Wales only. They show that the items included in our index cover about 78% of the total agricultural production of England and Wales.

Quantity. Here again returns for 1925 have been used. In that year conditions in British agriculture had returned to normal after the exceptional conditions of the first World War. In 1925 more detailed information was included in the official returns than in previous years.

(a) *Arable Production. (Pflanzliche Produktion).* Our index includes about 62% of all arable and market garden produce that can be measured in terms of "starch equivalents." Nearly one-third (31%) of agricultural production is accounted for by clover, hay and straw.² The remainder consists of other agricultural and market garden products which do not have a significant production when calculated in "starch equivalents."³

(b) *Livestock (Tierische Produktion).* The production included in our index covers (in terms of "starch equivalents") about 97% of total livestock production. The production of eggs and hens was only about 39,300 tons (starch equivalent) in 1925 in comparison with a total output of 1,285,200 tons (starch equivalent).⁴

It is difficult to make a similar check for an earlier period than 1925 because the official returns of production in previous years were less detailed. However—except for hay and straw—our estimates for 1925 cover so large a part of the total agricultural production that we have not felt it necessary to test our figures for earlier periods. Moreover it was only in the

¹*The Agricultural Output of England and Wales, 1925* (Cmd. 2815 of 1927), p. 76.

²According to Table VII in the Appendix, hay, straw and clover accounted in 1925 for 34.3% of agricultural production.

³See Appendix, Table VII.

⁴See Appendix, Table VIIA.

period immediately after the first World War that the specialised products, omitted from our estimates, became of real importance. In earlier periods the basic products included in our index embraced an even larger share of total agricultural production. Hay and straw are of relatively little significance from the point of view of value of production but of considerably greater importance from the point of view of "starch equivalents." Although omitted from our index of arable production the production of hay and straw is, in fact, to a great extent included—in another form—in our index of livestock production.

The relationship between the value of arable and livestock production in the joint index for total agricultural production is as follows :—¹

Average for 1909-13	Great Britain	Ireland
	Per cent.	Per cent.
Arable Production	43·3	31·7
Livestock Production (excl. wool) ...	53·6	68·3
Wool	3·1	—
Total Agricultural Production ...	100·0	100·0

By representing agricultural production in terms of "starch equivalents" it is possible to add together various types of product and so calculate both the total arable and the total livestock production. It is clear that if we use this method arable production is much greater than livestock production. It would not be possible to add the "starch equivalents" of the arable and livestock production—to get a grand total—because those arable products consumed by livestock on the farm would be counted twice. Arable production and livestock output can be added together if prices are used as weights. The production of wool, flax, etc. obviously cannot be estimated in terms of "starch equivalents." It will be seen therefore that there are limits to the use that can properly be made of "starch equivalents."

¹See Appendix, Table VIII.

4. *The Economic Production Index.*

By using an economic index it is possible to make an estimate of total agricultural production and to add together physically different types of product. The Economic Production Index covers twelve items while the Physical Production Index covered only eleven (wool being excluded). The whole period of 64 years has been weighted with the average prices for 1909-1913. We feel justified in doing this since the relationship between the prices of the major agricultural products did not change very much in the period under review. The general pattern of the index would not be changed to any significant degree if weights from several different years were to be used.

If we compare the two indices for arable and livestock production—weighted by “starch equivalent” and by prices—it will be seen that there is no very great difference between them. In the arable indices the output shown by the physical production index “starch equivalent” is generally greater than that of the economic production index (prices). The two livestock production indices (excluding wool) are closely parallel. Since the prices of products with a high “starch equivalent” are higher than those with a low “starch equivalent” it is to be expected that there would be a fairly close correspondence between figures adjusted by the two weighting systems.

LEO DRESCHER.

TABLE I. ESTIMATE OF CULTIVATED AREA OF GREAT BRITAIN, 1700-1854 (in 1,000 acres)
(E + W = England and Wales, S = Scotland)*

	about 1700	1771		1798		1812		1821		1827		1838		1846		1853		1854	
		E+W	E+W	E+W	E+W	S	E+W	S	E+W	S	E+W	S	E+W	S	E+W	E+W	E+W	S ¹	
Wheat...	—	2,795	3,000	3,160	140	—	—	—	—	—	—	—	—	3,800	350	3,779	3,661	335	
Oats ...	—	—	—	2,585 ²	1,241 ²	—	—	—	—	—	—	—	—	2,500 ³	1,300	—	1,303	680	
Barley ...	—	—	—	861	281 ³	—	—	—	—	—	—	—	—	1,500	450	—	2,668	800	
Total Cereals ...	—	—	—	6,606	1,662	—	—	—	—	—	—	—	—	7,800	2,100	—	7,604 ⁴	1,815	
Leguminous Plants ...	—	—	—	—	—	—	—	—	—	—	—	—	—	500	50	—	698	70	
Potatoes ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	192	—	
Turnips and Mangolds	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2,445	—	
Root Crops ...	—	—	—	1,200	487	—	—	—	—	—	—	—	—	2,000	650	—	2,637	860	
Fallow ...	—	—	—	2,297	218	—	—	—	—	—	—	—	—	1,500	100	—	896	60	
Clover...	—	—	—	1,149 ⁵	—	—	—	—	—	—	—	—	—	1,300	450	—	2,820 ⁶	980	
Meadow ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12,987	—	
Total Cultivated Area	21,000	—	—	—	—	—	27,900	5,050	28,749	5,265	28,799	5,265	—	—	—	—	27,654	5,265	

¹ Percentage of 1846. ² In our source "oats and beans" are given together : we have deducted 10% for beans. ³ Including rye.

⁴ Including 73,731 acres rye. ⁵ Including ryegrass. ⁶ Including lucerne, ryegrass, etc.

¹ Percentage of 1846. ² In our source "oats and beans" are given together : we have deducted 10% for beans. ³ Including rye. ⁴ Including 73,731 acres rye. ⁵ Including ryegrass. ⁶ Including lucerne, ryegrass, etc.

*Sources : J. Percival, *Wheat in Great Britain* (1934), p. 53 (citing figures of A. Young and J. Billingsley) ; J. R. McCulloch, *A Descriptive and Statistical Account of the British Empire* . . . (3rd edn., 1847), Vol. I, p. 548 et seq. and p. 536 ; *Journal of the Statistical Society*, Vol. I (1838), p. 56 and Vol. 43 (1880), p. 330 ; *Reports of Poor Law Inspectors and Agricultural Statistics* (England), 1854 (in *Agricultural Statistics* (England), 1855) ; C. Davenant, *An Essay upon the probable Methods of making a people gainers in the Balance of Trade* (London, 1699), p. 70 ; *Einige Betrachtungen über den Getreide-Handel zwischen England und dem übrigen Europa* (Frankfurt am Main, 1829), p. 29 ; H. Meidinger, *Das britische Reich in Europa* . . . (Leipzig, 1851), p. 98 et seq. (citing W. Cowling's estimates : Meidinger states that Cowling's estimates for Scotland are too high).

TABLE II
ESTIMATE OF YIELD PER ACRE IN GREAT BRITAIN 1771-1850
(in bushels per acre) ¹

Year	Wheat	Barley	Oats and Rye	Peas and Beans
GREAT BRITAIN				
1771	24	—	—	—
1798	20	—	—	—
1801	24	—	—	—
1812	20-24	32	36	—
1839	26	32	36	—
1846	32	36	40	30
about 1850 ...	34 *	42	52 *	—
SCOTLAND				
1846	28	32	40*	24

* Oats only.

¹Sources : J. Percival, *Wheat in Great Britain* (1934), p. 53 (citing figures of J. Billingsley and B. P. Clapper) ; J. R. McCulloch, *op. cit.*, Vol. I, p. 549 and p. 563 ; and H. Meidinger, *op. cit.*, p. 93 (who quotes from English sources).

²J. Caird, *English Agriculture in 1850 and 1851* (1852), p. 475 where an estimate of 26.6 bushels per acre is given.

TABLE III
ESTIMATE OF CARCASE WEIGHT AND MILK YIELD
IN THE U.K.¹

Year	Weight of Carcase					Yield of Milk in galls.
	Oxen	Calves	Sheep	Lambs	Pigs	
	in lbs.					
1867/70 ...	560	75*	56	34**	90	—
1871	600	—	60	—	134	—
1878	—	—	—	—	—	440
1903	660	95	65	41	135	—
1908	672	98	67	38	160	535
1925	628	87	60	39	160	535

* Calculated as % of carcass weight of cattle according to estimates of 1925 and 1908 (to nearest unit). ** Calculated as % of weight of sheep according to estimates of 1925 and 1908 (to nearest unit).

¹Sources : *The Agricultural Output of England and Wales, 1925* (Cmd. 2815 of 1927), p. 59 and *Journal of the Royal Statistical Society*, Vol. 46 (1883), p. 25 and p. 28 and Vol. 67 (1904), p. 377.

TABLE IV
MEAT PRODUCTION IN THE UNITED KINGDOM 1901-1931¹

Year	A. Report of Ministry of Agriculture and Fisheries	B. Drescher's Estimate	B. in relation to A.
	in 1,000 long tons		%
United Kingdom			
1901	1,452	1,212	83
1902	1,473	1,119	76
1903	1,425	1,260	88
1904	1,452	1,281	88
1905	1,474	1,243	84
1906	1,439	1,246	87
1907	1,420	1,293	91
1908	1,425	1,335	94
1909	1,521	1,296	86
1910	1,482	1,290	87
1911	1,442	1,348	93
1912	1,572	1,312	83
1913	1,516	1,243	82
1914	1,355	1,311	97
1915	1,537	1,284	84
1916	1,440	1,285	89
1917	1,497	1,204	80
1918	1,289	1,184	92
1919	1,147	1,146	100
1920	1,225	1,113	91
1921	1,169	1,150	98
1922	1,325	1,158	87
1923	1,299	1,230	95
1924	1,320	1,183	90
England and Wales			
1925	855	738	86
1926	816	722	88
1927	802	776	97
1928	902	789	87
1929	920	735	80
1930	845	734	87
1931	796	803	101

¹Sources : *Report on the Trade in refrigerated Beef, Mutton and Lamb* (Ministry of Agriculture and Fisheries. Economic Series, No. 6), (London 1925), p. 58 ; *The Agricultural Output of England and Wales, 1925* (Cmd. 2815 of 1927) ; *The Agricultural Output of England and Wales, 1930-1* (Cmd. 4605 of 1934).

TABLE V
LIVESTOCK PRODUCTION IN ENGLAND AND WALES
1925 to 1931 ¹

	1925	1931		1925	1931
A. Calculated from Census Statistics					
<i>Meat Production</i> (in 1,000 cwt.)			<i>Starch Equivalent</i> (in 1,000 tons)		
Beef... ..	6,902	7,413	Beef and Veal... ..	204·3	218·5
Calves	614	628			
Mutton	2,446	2,913	Mutton	63·6	75·7
Pigs	6,429	4,967	Pork	242·7	187·5
Total	16,391	15,921	Total	510·6	481·7
<i>Milk Production</i> (in million galls.) ...	1,117	1,263	<i>Starch Equivalent</i> (in 1,000 tons)		
			Milk	774·6	875·6
			Total *	1,285·2	1,357·3
B. Calculated from Number of Beasts					
<i>Number of Beasts</i> (in 1,000s)			<i>Slaughtered Cattle</i> (in 1,000s)		
Beef and Veal	6,163	6,065	Beef	1,165	1,146
			Calves	499	491
Sheep and Lambs	15,975	17,749	Sheep	4,856	5,396
			Lambs	1,214	1,349
Pigs	2,644	2,783	Pigs	3,199	3,369
<i>Meat Production</i> (in 1,000 tons)			<i>Starch Equivalent</i> (in 1,000 tons)		
Beef	332·8	349·3	Beef and Calves	188·9	198·4
Calves	20·0	21·6			
Sheep	132·1	164·6	Sheep and Lambs	78·3	96·3
Lambs	21·2	23·6			
Pigs	231·9	244·3	Pigs	172·4	181·5
			Total	439·6	476·2
Milking Cows (1,000s)	2,713	2,790	<i>Starch Equivalent</i> (in 1,000 tons) ...	906·0	931·7
Milk Production (in million litres) ...	5,931**	6,099†	Total	1,345·6	1,407·9

* A as % of B : 1925, 95·5 ; 1931, 96·4.

** i.e. 1,300 million gallons approx.

† i.e. 1,340 million gallons approx.

¹Source : *The Agricultural Output of England and Wales, 1925* (Cmd. 2815 of 1927), p. 59 and *The Agricultural Output of England and Wales, 1930-1* (Cmd. 4605 of 1934, p. 19.

TABLE VI
LIVESTOCK PRODUCTION IN ENGLAND AND WALES, 1922-31

A. Official Returns		B. Drescher's Estimates		B. in relation to A.
Harvest Year		in 1,000 tons of starch equivalent	Year	in %
1924/25	...	1,285 ¹	1924	104.7
		1,309 ²	1925	102.8
1925/26	...	1,296	1926	103.4
1926/27	...	1,308	1927	106.4
1927/28	...	1,390	1928	99.4
1928/29	...	1,412	1929	94.8
1929/30	...	1,367	1930	96.9
1930/31	...	1,357	1931	103.7

¹The Agricultural Output of England and Wales, 1925 (Cmd. 2815 of 1927, p. 59.

²The Agricultural Output of England and Wales, 1930-31 (Cmd. 4605 of 1934), p. 19.

TABLE VII
ARABLE PRODUCTION IN ENGLAND AND WALES, 1925

Product	Production		Starch Equivalent	Production	
	1,000 long tons	1,000 tons	per ton	in 1,000 tons of starch equivalent	%
Wheat	1,360	1,382	0.701	969	14.2
Barley	1,010	1,026	0.705	723	10.6
Oats	1,379	1,401	0.592	829	12.1
Beans... ..	159	162	0.666	108	1.6
Peas	64	65	0.686	45	0.7
Potatoes	3,214	3,265	0.197	643	9.4
Turnips	9,198	9,345	0.048	449	6.6
Mangolds	7,130	7,244	0.063	456	6.7
Included in Index...	—	—	—	4,222	61.9
Rye	26	26	0.703	18	0.3
Maslin (wheat and rye mixed) ...	94	96	0.675	65	0.9
Sugar Beet	428	435	0.158	69	1.0
Clover	2,562	2,603	0.097	252	3.7
Hay	4,538	4,611	0.300	1,383	20.3
Straw	4,360	4,430	0.160	709	10.3
Vetch	15	15	0.697	10	0.1
Vetch (hay) ...	18	18	0.074	1	—
Lucerne	67	68	0.085	6	0.1
Kale	140	142	0.067	10	0.1
Mustard	10	10	0.072	1	—
Carrots	110	112	0.052	7	0.1
Turnips	100	102	0.042	5	0.1
Cabbage	410	417	0.090	61	0.9
Cauliflower ...	93	94			
Brussel Sprouts ...	162	165			
Green Beans ...	73	74	0.075	6	0.1
Green Peas... ..	34	35	0.075	3	—
Hops	18	18	0.287	5	0.1
Total	—	—	—	6,768	100.0

TABLE VIIa
LIVESTOCK PRODUCTION IN ENGLAND AND WALES IN 1925

<i>Egg Production :</i>					
Hen Eggs (55 g.)	1,458 million eggs	= 80,190 tons	= 30,300 tons starch equivalent		
Duck Eggs (70 g.)	43 " "	= 3,010 "	= 1,140 " "		
<i>Poultry :</i>					
Hens (1 kg.)	15 million	= 15,000 tons			
Ducks (1 kg.)	1.70 "	= 1,700 "			
Geese (3.5 kg.)	0.45 "	= 1,575 "			
Turkeys (1 kg.)	0.50 "	= 500 "			
Poultry total	... ..	18,775 "	= 7,900 " "		
Egg and Poultry Production together	... ..	39,300 tons starch equivalent	= 3%		
Remaining Meat and Milk Production	... ..	1,245,900 " "	= 97%		
Total Production	... ..	1,285,200 " "	= 100%		
(Calculated from Census of Agricultural Output).					

TABLE VIII
SHARE OF SEPARATE AGRICULTURAL PRODUCTS IN THE
TOTAL VALUE OF THE PRODUCTS INCLUDED IN
DRESCHER'S INDEX (Average 1909-13)

Product	Great Britain		Ireland	
	in £1,000	in %	in £1,000	in %
Wheat	12,099	6.0	273	0.4
Barley	9,326	4.6	1,188	1.9
Oats	15,165	7.5	4,756	7.6
Rye	—	—	48	0.1
Beans	2,016	1.0	16	—
Peas	1,042	0.5	14	—
Potatoes	12,503	6.2	7,519	11.9
Turnips	24,968	12.4	4,401	7.0
Mangolds	10,287	5.1	1,760	2.8
Total Arable Production	87,406	43.3	19,975	31.7
Beef	25,026	12.4	14,243	22.6
Pork	13,816	6.8	5,663	9.0
Mutton	18,276	9.1	2,475	3.9
Milk	51,019	25.3	20,603	32.8
Total Livestock Production	108,137	53.6	42,984	68.3
Wool	6,330	3.1	—	—
Total Agricultural Production	201,873	100.0	62,959	100.0

TABLE IX
PHYSICAL VOLUME INDEX (1909-13 = 100)

Year	Arable Production			Livestock Production		
	Gt. Britain	Ireland	U.K.	Gt. Britain	Ireland	U.K.
1866.....	101.1	99.9	100.9	55.4	69.4	59.4
1867.....	98.0	105.4	99.3	60.4	70.1	63.1
1868.....	118.9	117.8	118.7	62.0	66.9	63.5
1869.....	111.1	104.9	110.0	60.7	70.1	63.4
1870.....	115.6	118.3	116.0	62.2	73.7	65.5
1871.....	111.2	102.0	109.6	62.1	75.7	66.0
1872.....	100.5	82.8	97.4	65.4	75.7	68.4
1873.....	103.4	94.4	101.9	67.5	74.2	69.5
1874.....	121.7	109.4	119.5	69.1	73.8	70.4
1875.....	119.6	115.7	118.9	68.0	76.4	70.4
1876.....	108.5	114.8	109.6	67.6	78.1	70.6
1877.....	94.4	78.2	91.5	68.2	78.4	71.1
1878.....	112.2	92.0	109.2	68.9	76.9	71.2
1879.....	73.1	61.8	71.1	69.1	75.3	70.9
1880.....	109.5	97.7	107.4	68.7	71.5	69.6
1881.....	110.7	102.1	109.2	69.3	73.8	70.6
1882.....	100.4	81.7	97.1	71.1	76.5	72.7
1883.....	109.2	99.8	107.5	73.3	77.5	74.6
1884.....	113.0	89.5	108.9	76.3	76.0	76.2
1885.....	104.6	81.5	100.6	79.8	78.9	79.5
1886.....	109.7	87.3	105.7	79.7	79.1	79.5
1887.....	100.3	83.8	97.4	80.2	79.7	80.0
1888.....	104.2	84.5	100.8	78.6	79.4	78.9
1889.....	110.0	91.0	106.6	79.5	79.7	79.6
1890.....	109.9	75.3	103.8	84.4	85.8	84.8
1891.....	107.6	98.5	106.0	89.1	85.8	88.2
1892.....	103.5	87.4	100.7	86.9	85.2	86.4
1893.....	94.1	95.0	94.3	84.3	85.3	84.6
1894.....	108.0	79.2	102.9	82.9	87.5	84.2
1895.....	96.9	98.3	96.9	86.0	86.9	86.2
1896.....	100.8	87.0	98.4	87.8	88.0	87.9
1897.....	98.8	67.0	93.2	86.5	88.7	87.1
1898.....	105.1	95.6	103.4	89.6	89.1	89.5
1899.....	96.9	90.5	95.8	93.3	91.6	92.8
1900.....	90.3	77.4	88.0	91.0	92.3	91.4
1901.....	96.4	98.4	96.8	90.1	94.0	91.3
1902.....	107.1	97.1	105.3	89.5	96.7	91.6
1903.....	94.0	76.3	90.9	92.7	96.7	93.9
1904.....	95.0	83.1	92.9	96.2	96.9	96.4
1905.....	101.7	95.1	100.5	95.8	95.0	95.7
1906.....	104.2	88.0	101.4	96.8	96.7	96.8
1907.....	103.6	83.2	100.0	99.3	101.4	100.0
1908.....	103.2	99.3	102.5	101.2	100.4	101.1
1909.....	108.8	103.1	107.8	100.6	98.0	99.8
1910.....	104.4	94.1	102.6	99.7	98.5	99.4
1911.....	95.0	104.5	96.7	103.0	100.4	102.3
1912.....	94.6	90.4	93.9	100.6	101.9	101.0
1913.....	97.2	107.9	99.0	96.1	101.1	97.6
1914.....	102.9	101.5	102.7	103.9	104.5	104.1
1915.....	100.8	110.2	102.5	102.3	101.1	102.0
1916.....	92.8	93.5	92.9	100.7	101.9	101.1
1917.....	102.7	125.5	108.2	98.8	97.7	98.5
1918.....	123.4	139.9	126.4	98.9	95.3	97.9
1919.....	100.7	108.0	102.0	98.3	95.8	97.6

Continued—

Table IX—(Contd.)

Year	Arable Production			Livestock Production		
	Gt. Britain	Ireland	U.K.	Gt. Britain	Ireland	U.K.
1920.....	104.9	83.3	101.1	92.3	97.0	93.6
1921.....	97.5	82.8	94.9	98.6	99.1	98.7
1922.....	100.9	90.5	99.0	99.1	101.9	99.9
1923.....	92.4	72.7	88.9	103.6	104.6	104.0
1924.....	94.3	72.3	90.4	103.8	101.3	103.0
1925.....	92.5	91.2	92.3	108.1	93.3	103.9
1926.....	91.2	96.1	92.1	107.9	95.3	104.3
1927.....	85.1	104.3	88.5	112.0	102.1	109.2
1928.....	87.8	99.2	89.8	111.2	102.9	108.9
1929.....	91.4	115.2	95.6	108.2	100.6	106.0
1930.....	77.3	97.9	80.9	107.3	101.6	105.7
1931.....	71.0	85.0	73.5	113.2	103.5	110.4

TABLE X
ECONOMIC VOLUME INDEX (1909-13 = 100)

Year	Gt. Britain	Ireland	U.K.	Year	Gt. Britain	Ireland	U.K.
1866.....	75.1	77.4	75.7	1900.....	92.6	87.8	91.5
1867.....	77.5	79.6	78.0	1901.....	93.5	96.1	94.1
1868.....	85.3	80.8	84.2	1902.....	97.9	97.0	97.7
1869.....	82.4	79.3	81.6	1903.....	89.8	89.9	89.9
1870.....	84.2	86.1	84.7	1904.....	96.9	92.9	95.9
1871.....	83.6	82.6	83.3	1905.....	98.4	95.0	97.6
1872.....	80.6	76.2	79.6	1906.....	99.8	93.6	98.3
1873.....	83.9	79.3	82.8	1907.....	100.7	94.8	99.4
1874.....	91.4	83.7	89.6	1908.....	103.0	100.5	102.4
1875.....	91.9	87.5	90.9	1909.....	104.8	99.6	103.5
1876.....	85.4	88.5	86.2	1910.....	103.0	97.0	101.6
1877.....	79.5	76.6	78.8	1911.....	98.4	102.6	99.4
1878.....	87.8	80.4	86.0	1912.....	97.8	97.7	97.8
1879.....	69.8	68.9	69.6	1913.....	96.0	103.1	97.7
1880.....	86.8	78.3	84.8	1914.....	101.5	103.2	101.9
1881.....	86.4	81.3	85.2	1915.....	99.9	104.0	100.9
1882.....	82.4	76.7	81.1	1916.....	95.9	98.8	96.6
1883.....	88.5	84.0	87.0	1917.....	99.1	107.2	101.0
1884.....	93.0	79.7	89.8	1918.....	105.0	107.4	105.6
1885.....	89.6	81.5	87.7	1919.....	95.6	98.0	96.2
1886.....	94.4	80.8	91.2	1920.....	95.4	91.6	94.5
1887.....	88.3	80.7	86.5	1921.....	93.0	92.8	93.0
1888.....	90.0	83.5	88.5	1922.....	96.8	97.0	96.8
1889.....	93.8	82.9	91.2	1923.....	95.0	93.7	94.7
1890.....	96.2	82.3	92.9	1924.....	96.1	90.9	94.9
1891.....	97.8	90.1	96.0	1925.....	97.7	91.8	96.3
1892.....	95.8	85.9	93.5	1926.....	97.6	94.8	96.9
1893.....	90.7	88.6	90.2	1927.....	96.8	102.3	98.1
1894.....	94.8	84.3	92.4	1928.....	98.1	101.7	98.9
1895.....	92.4	90.7	92.0	1929.....	98.6	105.3	100.2
1896.....	94.2	88.2	92.8	1930.....	91.9	100.4	93.9
1897.....	93.6	81.6	90.7	1931.....	92.2	98.2	93.6
1898.....	96.1	91.6	95.0				
1899.....	93.8	91.5	93.2				

Drescher's Index: A Comment

When using an index it is desirable to know, first, exactly what the index purports to measure and, second, how satisfactorily it performs its function. The first is a question of definition, the second of the validity and reliability of the basic data. In the case of an index of the output of British Agriculture, the principal difficulty has been the precise meaning to be given to the term "output." The first step is to define gross output: this involves making a clear distinction between total production, which may be defined as the aggregate quantity of crops, livestock and livestock products grown, reared and produced on farms, and gross output, which is total production minus the quantity of the various products used for "seed, feed and waste," in other words, that part of total production which leaves the "national farm."¹ The concept net output is not here in question.

EARLY ESTIMATES

Estimates of the production or gross output of English Agriculture before 1866, when annual Agricultural Statistics were first compiled, include Gregory King's of 1696, a realistic attempt at a gross output calculation, and McCulloch's of 1837 which he labelled Net Produce but which in fact also approximates to gross output. Caird, using 1867 data, estimated the total "home produce" of Great Britain and Ireland, but this is more nearly a total production than a gross output calculation. That Caird was to some extent aware of the danger of double counting involved in adding crops and livestock is revealed by his curious remark that "the pigs [omitted from his total] are comprised in the meal and potatoes."²

¹For definitions of total production, gross, and net output in use to-day, see L. Napolitan, *National Output and Income Accounting*, *Farm Economist*, Vol. VII, No. 5, 1953, pp. 195-7.

²For G. King, see supplement to G. Chalmer's *Comparative Strength of Great Britain*, 1804. For McCulloch, see C. Clark, *National Income and Outlay*, 1937, pp. 227, 243; but compare, J. R. McCulloch, *Account of the British Empire*, Vol. I, 4th edition, 1854, pp. 548-50, 563-4 and 571-3. Sir Joseph Caird, *J.R.S.S.*, 1868, pp. 127-45.

CENSUS OF PRODUCTION REPORTS

Although estimates of the production and output of individual commodities appeared frequently in the late nineteenth century, the next gross output calculation was that based on the 1908 Agricultural Census material.¹ Here, for the first time, gross output was adequately distinguished from total production. "The total 'output' of the agricultural land of Great Britain is represented by the value of the products sold off the farms for consumption." On this definition, the output of crops totalled £46.6 millions as against a total crop production of £125 millions.

The next Census report was that for 1925. The term "output" was discussed and explicitly defined as "the estimated quantity of produce sold by farmers to the non-farming community, together with the quantity consumed in the farmer's own household."² The phrase "produce sold off farms" bore the same meaning.

The third Census report, referring to 1930-1, appeared in 1934. The definition of output was identical with that of 1925 and it was specifically noted that it "is essential . . . that this element of duplication should be avoided."³

DRESCHER

Drescher's paper appeared in 1935 and he was familiar with the Census reports. It is thus the more surprising that Drescher does not at any point define the meaning he attaches to either *Produktion* or *Erzeugnis* and would seem moreover to use the terms synonymously. What then does Drescher's index measure?

To appraise the validity and reliability of the sources and the methods used by Drescher in constructing his index is difficult, because, within the confines of a single paper, Drescher was unable to provide all the basic data. In particular, one regrets the absence of the 1909-13 prices, the averages of which

¹*The Agricultural Output of Great Britain, 1908*, Cd. 6277 of 1912, p. 25.

²*The Agricultural Output of England and Wales, 1925*, Cmd. 2815 of 1927, p. 75.

³*The Agricultural Output of England and Wales, 1930-1*, Cmd. 4605 of 1934, pp. 3, 36-7.

were used as "economic weights,"¹ and of any series of the quantities of individual commodities. In the absence of this information an indirect approach is suggested.

Dividing Drescher's index into its two parts, arable and livestock, it is noticeable that the proportion between them is different from that to be found in any of the Census reports.

Percentage by value at current prices	Census			Drescher G.B.
	1908 G.B.	1925 E. & W.	1930-1 E. & W.	average of 1909-13
Arable	30.9	32.6	29.8	43.3
Livestock	69.1	67.4	70.2	56.7

The difference is due to the disproportionate size of Drescher's arable component considered as output. As was seen from the 1908 figures, the deductions from total arable production necessary to arrive at gross output are large.

Drescher estimates crop production directly from acreage and yield figures given in the official *Agricultural Statistics* of Great Britain and of Ireland: no reference is made to any deductions for seed or feed. The following table compares the value of the commodities included in Drescher's index for 1909-13 with their corresponding values for 1911-13 in Ojala's series, which is the most recent work on the subject.² Allowing for the slight difference in base years and Drescher's exclusion of Northern Ireland, close agreement is found between Drescher and Ojala's Production column (1) for the cereal crops. Differences of yield and (or) price estimation are apparent with potatoes.

¹The choice of base years is important, as the "relationship between the prices of the major agricultural products" did, in fact, change during the period. The arable output of 1867-9 constituted 45.3% of total gross output at current prices but only 35.5% at 1911-13 prices. Again, the 1867-9 output of wheat constituted 15.4% of total gross output at current prices but only 9.9% at 1911-13 prices.

²E. M. Ojala, *Agricultural and Economic Progress*, 1952, Appendix, pp. 191-217.

A. THE PRODUCTION AND OUTPUT OF AGRICULTURE IN THE U.K.

Product	Value in £ millions			Percentage	
	Drescher * average of 1909-13	Ojala † average of 1911-13		Drescher	Ojala (11)
		Production (1)	Gross Output (11)		
Wheat	12.37	12.24	9.18	5	4
Rye	0.05	0.10	0.10	—	—
Barley	10.51	11.23	9.47	4	4
Oats	19.92	20.40	4.31	8	2
Potatoes	20.02	15.22	10.65	8	5
Turnips	29.37	[26.66]	—	11	—
Mangolds	12.05	[9.04]	—	4	—
Beans	2.03	1.58	0.79	1	1
Peas	1.06	0.90	0.49		
Other Crops ...	—	—	21.24	—	10
Total Arable ...	107.38	[97.37]	56.23	41	26
Beef and Veal ...	39.27	47.43	47.43	15	21
Mutton and Lamb	20.75	25.01	25.01	8	11
Pigmeat	19.48	20.63	20.63	7	9
Milk ‡	71.62	[52.83]	52.83	27	24
Wool	6.33	3.71	3.71	2	2
Other Livestock ...	—	—	16.28	—	7
Total Livestock ...	157.45	[149.61]	165.89	59	74
TOTAL	264.83	[246.98]	222.12	100	100

* U.K. excluding Northern Ireland throughout.

† U.K. excluding Eire after 1922.

‡ Both Drescher's and Ojala's are milk output calculations.

[] Estimated.

Drescher is more informative concerning his livestock index ; here production and output are identical except in the case of milk. Drescher's approach to the problem of meat output is sound, particularly his assumption that, with technical progress, the percentage of livestock numbers annually slaughtered increases ; consumer preference for smaller joints in the twentieth century led to slaughter at an earlier age. The correlative of this trend, *i.e.*, that the average carcase weight declined, was overlooked by Drescher with the result that his own calculation did not shew the 6% fall in average

beef carcase weight between 1908 and 1930-1 disclosed by the Census reports for those years. Nevertheless, Drescher's total meat output, admittedly of a "rough and ready character" accords fairly well with Ojala's.

The discrepancy between Drescher's milk output figure and that of the 1925 Census is explained by Drescher's having applied an annual average yield figure per *cow and heifer in milk* to the number of *cows and heifers in milk and in calf*. For the years 1878, 1908, and 1925, Drescher's yields are 440, 535, and 535 gallons respectively; Ojala's, for the same years, were 350, 402, and 421. Considered as a whole, Drescher's livestock total shews a good agreement with Ojala's more refined calculation.

The crucial difference between the two emerges when Drescher's arable series is compared with Ojala's gross output column (11). His treatment of the important feed crops, oats, turnips and mangolds, confirms the suspicion that Drescher's economic index is, in total, a straightforward production index to the extent to which the twelve products included are consistently representative through time of total agricultural production, arable plus livestock. It may be noted that poultry, eggs, fruit, and vegetables, products of rapidly increasing importance in the twentieth century, are excluded by Drescher.

That Drescher's aim was not simply an index of production may be deduced from his comment on hay and straw. "Although omitted from our index of arable production the production of hay and straw is, in fact, to a great extent included—in another form—in our index of livestock production."¹ The same argument could be extended, and more properly,² to turnips and mangolds which, however, are included in Drescher's arable index and account for two-fifths of its total value in 1909-13. There is, too, the peculiar statement that it "would not be possible to add together the Starch Equivalents of the arable and livestock production—to get a grand total—because those arable products consumed by livestock on the farm would be counted twice. Arable production and livestock production can be added together if prices

¹Drescher, p. 165.

²More properly, because that part of the total production of hay and straw sold to non-farm horses is legitimately included in gross output.

are used as weight.”¹ The confusion springs directly from Drescher's failure to clarify his concepts of output and production.

In spite, however, of the differences, both in definition and computation, between Drescher and Ojala, their two final indices are broadly in harmony.

B. THE TWO INDICES BY GROUPS OF YEARS

1911-13 = 100	Drescher *	Ojala †
1867-9	83	89
1870-6	87	93
1877-85	85	90
1886-93	93	94
1894-1903	95	95
1904-10	102	99
1911-13	100	100
1920-2	96	95
1923-9	99	81
1930-4	96	84

* U.K. excluding Northern Ireland throughout.

† U.K. excluding Eire after 1922.

The difference in concept, *i.e.*, production as against gross output, does not, however, explain why Drescher's index shews a steeper rise between 1867-9 and 1911-13 than does Ojala's index of output. A production index (1), analogous to Drescher's² and derived from Ojala's data, rises less than Ojala's output index (11) between these dates.³ This is due to the greater weight carried by the livestock component in the output index, relative to its weight in the production index, during a period when livestock output increased and arable production and output declined following the relative fall in arable prices during the Great Depression and the consequent shift to livestock farming.

¹Drescher, p. 165.

²Analogous, in that it includes only those commodities (12) included by Drescher.

³See Table C *infra*.

C. PRODUCTION AND OUTPUT AT CONSTANT (1911-13) PRICES
£ millions

	Drescher *		Ojala			
			Production (1)		Gross Output (11)	
	1867-9	1911-13	1867-9	1911-13	1867-9	1911-13
Livestock ...	100 46†	157 60	121 51	150 61	128 65	166 75
Arable ...	117 54	104 40	117 49	97 39	70 35	56 25
Total ...	217	261	238	247	198	222
Index ...	83	100	96	100	89	100

* Drescher's annual livestock and arable indices are applied to the figures given in Table A.

† The figures in italics shew the respective weights of the livestock and arable components.

Drescher's arable component shews close agreement with the arable component of the production index (1) derived from Ojala, but his livestock component increases by 57% between 1867-9 and 1911-13 compared with the 24% increase in the livestock component of Ojala (1). The 1911-13 livestock values conform, but Drescher's 1867-9 livestock total is almost one-fifth less than Ojala's (1) at the same date; it is barely equal to Caird's figure of livestock output for 1867 which excluded pig meat.¹

In brief, to judge by Drescher's 1909-13 and post 1919 data and by textual evidence, his index measures production; but its movement from 1867-9 to 1911-13 contrasts with that of a production index derived from Ojala. It is unfortunate that Drescher's omission of basic data makes it impossible to carry investigation further than to note that the point of difference between Drescher and Ojala, definitions apart, would appear to lie in the computation of livestock output during the nineteenth century.² It is the relatively large increase in

¹ £99.1 million at 1913 prices; given by Colin Clark, *National Income and Outlay*, 1937, p. 244.

² The difference progressively diminishes from 1867-9 to 1904-10.

Drescher's livestock component that is responsible for the steeper rise of his index up to 1911-13, apparent in the comparison with Ojala's output index in Table B.

CONCLUSION.

Drescher's was a first and gallant attempt at compiling an index of British agricultural output from 1867 onwards ; it was, moreover, an interim report of a wider investigation planned at Kiel Institute. It is chastening to recall that sixty-five years of Agricultural Statistics and three Censuses of Agricultural Production had not inspired an Englishman to the same task. If, as he could so easily, Drescher had formulated and logically applied a definition of output, he would have produced an index of greater value. As it is, although Drescher's is the only annual index extant, the stimulus to the study of National Income provided by the 1939-45 War has led to agreed definitions of gross and net output and to a sustained effort at the Oxford Agricultural Economics Research Institute to measure the gross and net output of the agriculture of Britain and the United Kingdom since 1867.¹ Provisional results were given by Ojala, in 1952, by groups of years ; we await the publication of the annual series.

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¹In addition to Napolitan, *locus cit.*, see the papers by D. J. Beilby and J. R. Bellerby, *Farm Economist*, Vol. VII, No. 5, 1953 ; J. H. Kirk, The Output of British Agriculture during the War, *J.A.E.S.*, Vol. VII, No. 1, June, 1946 ; and particularly J. R. Bellerby, Distribution of Farm Income in the U.K., 1867-1938, *J.A.E.S.*, Vol. X, No. 2, February, 1953.

The Impact of Commercial Growth on Agricultural Tenure Systems in India*

* Figures given in the paper unless otherwise stated have been taken from surveys directly conducted by the author, or surveys in which he was associated at different periods in India. The regional surveys in all cases were based on random samples over the region in 1950. This paper was prepared by the author as a research Scholar of the University of Manchester. The author acknowledges with thanks the suggestions for improvement he has had from Professor Lewis and Dr. Martin.

The share-cropping system of tenure is usually regarded by economists as backward, and it is generally expected that the growth of modern commerce will discourage this system of tenure.¹

The experience of students of rural economy in India however shows that share-cropping has been generally increasing in the last few decades during which India has been drawn into the vortex of modern economic developments.² The explanation commonly offered for this anachronism is that Indian agriculture is overcrowded and the pressure of population is at the back of all this.

¹ Type of Crops	Yield in mds. (82 lbs. approx.) per acre	
	Own land	Share-cropped land
Aman paddy	16.8	14.9
Ans paddy	11.7	10.3
Jute	11.2	8.8
Other crops	10.7	7.8
Survey of economic conditions in Bengal, 1946-49. (Unpublished).		

² Description of source	Percentage of area under share-cropping
Flouds Commission Enquiry (Govt. of Bengal)—1938	20.0
Plot by Plot Enumeration of Bengal (Govt. Bengal)—1944	39.3

These figures do not however give an estimate of the increase strictly as one (1938) is based on examination of representative area and the other (1944) on random sample, still the magnitude of the difference points towards an increase.

An enquiry by the author on a small area in 1946 showed that cultivators with holdings of 2-3 acres in 1930 had lost 56% of their land by 1946, and were cultivating the same on a share basis. See also Report of Agricultural Economic Conference, 1944.

The object of this paper is to show that, contrary to expectation on the above assumption, patterns of share-cropping in different regions do not follow the density pattern. On the contrary, the incidence of share-cropping is highly correlated with the degree of urbanization and commercial growth and as such is probably due to the economic impact of modern commercial growth itself. This anomaly, it is suggested, may be due to certain peculiar features of commercial development in India and their effect on agriculture.

Buchanan¹ has summed up the nature of the economic development of India in the following lines :

"The changes which India has experienced are much better described as a commercial than as an industrial revolution. The rapid growth of railway and foreign commerce brought specialisation in commercial crops and Indian farmers were offered cheap consumer goods in exchange for raw agricultural commodities. Self-sufficing local economy has been displaced by international competition . . . "

The benefit, whatever it was, that arose from this commercialisation of Indian agriculture did not go back either to the peasantry or to the agricultural industry in any form. To the extent that it was reinvested in rural areas, it found its way either into usury, or, landlordism. It is useful to note that as early as in 1872, this specific feature in the commercial expansion was pointed out by McNeil,² an economic expert appointed by the Governor of Bengal :

"The question then presents itself—who has reaped the benefit of the multiplied rental of the country? Government has appropriated a certain portion, Zemindar (landlord) has obtained a portion of the profit but a much smaller portion . . . The ryot (cultivators) again, though there can be no doubt that their position on the whole has improved and that the money value of the wages of labour and the profit of the small properties have largely increased are yet still in the position of living from hand

¹N. Buchanan, *The Development of Capitalist Enterprise in India*.

²McNeil's Report to the Lt. Governor contained in Revenue Administration Report of Bengal, 1872.

to mouth and have no accumulated resource to fall back upon in time of scarcity and distress.

Two important classes remain to be noticed, *viz.*, the trader and the moneylender and beyond all question these are the classes who have secured the mass of the increased wealth of the country . . . ”

A more recent analysis of the growth in wealth and economic power of this section and the nature of their reinvestment in rural areas may be found in the following memorandum submitted to the Floods Commission by the Peasant Association of Bengal ¹ in 1940. Here also it will be found that basically the same process as in 1872 was continuing in agriculture.

“Amongst other reasons encouraging the growth of share-cropping we may notice the growth of a new type of landlord—the moneylender-cum-landlord. He has made his money by the exploitation of the cultivator and his natural inclination is to invest his earnings in land : at the same time he is a petty trader in jute or wheat, or rice, very often the village grain trader or he may be interested in transport. In any case, the investment of the capital in land is more attractive to him under present conditions than investment in industrial concern, but he is not intending to cultivate it . . . as likely as not he will be an absentee landlord . . . this new type of landlord is already a trader in grains or in jute. It will pay him, therefore, to take as rent the jute or grain from his tenant rather than take cash and then have to buy the raw materials for his trade in the open market. In other words, he is rationalising his business vertically . . . the rate at which the area under cultivation by bargadar (share-cropper) is increasing is very significant of the change that is overtaking agriculture in Bengal . . . ”

The outcome of this process of commercial growth encouraging share-cropping was that, to the extent that commerce penetrated the economy of a region it was also accompanied by higher incidence of share-cropping or similar forms of leasing. The following table giving the percentage of

¹Memorandum submitted by the Bengal Provincial Kishan Sabha to the Floods Commission in 1940.

area share-cropped or leased, the percentage of population engaged in commerce and the percentage of urban to total population along with the density per square mile in rural areas confirms the above observation.

States	Percentage of population in Commerce ¹	Percentage of population in urban areas	Percentage of cultivated area under share-cropping or leasing	Density per square mile in rural areas
Bengal ²	9.3	24.80	22.0	610
Punjab	9.1	15.09	21.5	243
Bombay... ..	7.6	23.92	30.6	202
Madras	6.7	15.97	13.2	329
U.P.	5.0	12.46	10.7	453
Bihar	3.9	5.37	10.2	493

¹Census 1951, and Indian Directory for cols. (1), (2), and (4).

²In all cases Bengal refers to West Bengal, and Punjab to East Punjab.

The figures indicate that on the whole the ratio of share-cropped or leased area is related to the level of urban and commercial development which is the reverse of the density pattern.¹ The conclusion that suggests itself is that commercial

¹Correlation coefficients calculated for cols. (1), (2) with (3) were significant excepting the case of Bengal. It will be found that West Bengal while revealing the same correlation between share-cropping incidence and commercial development does not fall in line with the density pattern of the distribution of holdings. West Bengal being a State with both a high incidence of share-cropping and also a high level of commercial development it may be argued that here at least the high incidence of share-cropping may be due to a high density of population. The relationship between density of population and incidence of share-cropping within Bengal shows, however, the same pattern as in the rest of India. A set of figures is given below of the commercially developed regions of West Bengal (Howrah, Hooghly, T. Parganas) and the commercially undeveloped regions of East Bengal (Bakargunj, Faridpur, Noakhali, Tippera) both with high density of population making this point clear.

	Average rural density 1941 to a sq. mile	Average p.c. of urban population 1941	Percentage of area share-cropped
West Bengal ..	1,240	31.3	27.0
East Bengal ..	1,211	2.4	12.9

penetration of the economy has, instead of bringing about more progressive tenure systems, reintroduced old, wasteful and oppressive systems in agriculture.

That the increase in share-cropping is more directly related to commercial and urban influence rather than to general poverty in the area is still further confirmed from the table below giving the average size of holdings reduced to equally productive units ¹ and the percentage of area share-cropped or leased.

States			Average size of holdings (equi-productive unit) (in acres)	Percentage of area under share-cropping or lease
Bengal	...	...	2.50	22.0
Bihar	...	...	4.84	10.5
U.P.	...	...	6.14	10.7
Madras	...	...	5.58	13.2
Punjab	...	...	6.50	21.5
Bombay	...	...	9.26	30.6

Both from the above table and from general knowledge of the regional economy it may be said that Punjab, Bombay are more prosperous areas than Bengal or Bihar or Madras. But the higher incidence of share-cropping has not followed the level of economic condition in the regions. Rather the reverse. This goes to show that share-cropping has been stimulated not by general deterioration of economic conditions directly, but rather by the commercialisation of agriculture. This becomes also evident if we look at the figures for distribution of holdings in these areas in 1950.

¹Basing ourselves on the total output per acre of different regions as found in the Government of India's National Sample Survey Report, an index was constructed of acreage producing same yield for each province. The index of the different acreages with Bengal as base was used as a multiplying factor for other acreages. In other words every provincial acreage was reduced to a Bengal—equivalent in yield.

States (classified by incidence of share-cropping)	Percentage of total land owned by families in acreage-groups			
	0·1-1·00	1·00-5·00	5·00-10·00	10·00 & above
Bombay	0·3	4·2	8·1	87·4
Bengal	1·4	41·5	26·4	30·7
Punjab	0·3	4·2	11·8	83·7
Madras	1·1	16·7	21·1	61·1
U.P.	1·3	25·3	24·9	48·5
Bihar	0·6	16·1	26·9	56·4

Apart from Bengal which does not fall in line it may be said that for the rest of the states their rank in share-cropping incidence and urbanisation is associated with higher concentration in the upper groups. In States with higher levels of commercial developments small farms have given place to concentration at higher owning groups. This conclusion holds even after we take into account the relative difference in productivity.

This polarization in ownership has however been more in favour of urban owners, as far as the share-cropped area is concerned. This can be seen from a distribution of the share-cropped area by type of owners.

States	Percentage of total share-rented, or, leased area owned by		
	local cultivators and other rural non-commercial groups	commercial groups and urban landlords whose occupation could not be ascertained	Total
Bombay	34	66	100
Punjab	42	58	100
Bengal	59	41	100
Madras	50	50	100
Bihar	76	24	100
U.P.	93	7	100

Here again the percentage of urban owners seems to be highly correlated with share-cropping and with levels of urbanization.

The greater share in ownership by urban interests has also given them a greater share in control of the marketing of grains as was pointed out in the memorandum of the peasant association. The following figures from contemporary marketing reports¹ on the handling of the marketable surplus of food-grains by the regions agree with the above observation.

States	Percentage of area shared or leased	Percentage of Marketable supply of Food-grains handled directly by :	
		Cultivators	Traders, Wholesalers, Mill owners and their agents
Bombay ...	30.6	32.0	68.0
Bengal ...	22.0	30.0	70.0
Punjab ...	21.5	38.0	62.0
Madras ...	13.2	38.1	61.9
U.P. and Bihar	10.7 10.5	57.0	49.0

The percentage handled by traders and their agents or other urban interests does generally correspond with the percentage of area share-cropped, as may be expected.

It may therefore be concluded that it is the extension of commerce which is responsible for the growth of the share-cropping system of tenure. This effect seems to have taken place independently of the pressure of population and often in the reverse direction to patterns of rural density.

A. GHOSH.

¹Based on official marketing reports of the Provinces since 1944.

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Econometric Models and the Average Duration of Business Cycles

- I. THREE APPROACHES TO THE ANALYSIS OF CYCLICAL FLUCTUATIONS.
 - (a) mathematical.
 - (b) econometric.
 - (c) empirical measurement.
- II. ECONOMETRIC MODELS AND THE ELIMINATION PROCESS.
 - (a) implications of linear econometric models for average duration of cycles.
 - (b) reconciliation of criteria used in theoretical and empirical work.
 - (c) findings of National Bureau of Economic Research on the average duration of cycles.
- III. EXAMINATION OF QUESTIONS SUGGESTED BY THE DISCREPANCY BETWEEN THEORETICAL EXPECTATION AND EMPIRICAL FINDINGS.
 - (a) connection between autoregressive structure and the average duration of cycles.
 - (b) effect of autocorrelation of residuals upon average cycle duration.
 - (c) sampling variation in mean distance between peaks.
 - (d) changes in economic structure.
- IV. DIVERGENCES IN THE CYCLICAL EXPERIENCE OF DIFFERENT SECTORS OF THE ECONOMY.

I. THREE APPROACHES TO THE ANALYSIS OF CYCLICAL FLUCTUATIONS.

The cyclical fluctuations which characterize the great majority of economic time series display more or less continual variation in periodicity, amplitude and phase. It is the task of business cycle analysis to explain these fluctuations, and it is possible to distinguish three main methods which have been employed so far in studying this problem.

(a) *Mathematical approach.*

The conventional approach of the mathematical statistician is to enquire what type of mechanism or system might be presumed to have generated a series with the above-mentioned characteristics¹ It is a feature of this approach that the statistician tends to study a particular series in isolation and does not feel it necessary, for the purpose of elucidating facts about that series, to postulate anything about its inter-relations

¹See M. G. Kendall *Advanced Theory of Statistics*, Vol. II, Chapters 29 and 30 and also his *Contributions to the Study of Oscillatory Time Series*.

with other series in the economic system. A recent paper by Kendall² produced an interesting discussion on this point, at the end of which Professor Kendall defined his position as follows :—

“ . . . I think it is futile to lay down any rules as to whether fact should precede theory or theory fact. Scientific discovery proceeds by an alternation of the two . . . (Mr. Houthakker's) claim that ‘ even the most refined methods will not lead to valid and interesting results unless they are applied to suitable data within an acceptable theoretical framework ’ seems to me the negation of the scientific spirit. I have tried to elicit certain facts about economic series. They may be wrong, but if they are correct they are facts, irrespective of any theoretical framework.”³

Even when attention is confined to any single series a major difficulty is that several different types of generating mechanism can produce remarkably similar series. Three well known generating schemes for oscillatory series are :—

- (i) Harmonic waves.
- (ii) Moving average (or cumulation) of random terms.
- (iii) Autoregressive structures.

An example of an autoregressive scheme is :—

$$(1.1) \quad u_{t+2} = -a u_{t+1} - b u_t + \epsilon_{t+2}$$

where u_t denotes the value of the variable u at period t , a and b are constants and ϵ is a disturbance term, which is commonly assumed to be distributed normally and independently in successive time periods about mean zero with constant variance.

An autoregressive process seems to offer a plausible representation of an economic series, since the value of the series at any period of time is made to depend both upon immediately preceding values of the series and also upon any disturbances peculiar to the current period : furthermore, the disturbance of the current period affects not only the current value of the series but also the future motion of the system. This point is supported by the considerations of Section II (a) where it is shown that certain types of economic models reduce

²The Analysis of Economic Time Series, Part I, Prices. *Journal of the Royal Statistical Society*, Part I, 1953.

³op. cit. p. 34.

to linear autoregressive schemes for each of the variables involved. A point of interest is the apparent generality of the second-order linear process (1.1) in the description of economic series: Kendall found in his empirical work that no significant gain in representation was obtained by taking either linear regressions of higher order than the second or curvilinear regressions.⁴

Such linear autoregressive schemes generate series with varying amplitude and periodicity, and their use was first suggested by Yule.^{4a} The underlying structure defined by the second-order, *homogeneous* equation

$$(1.2) \quad u_{t+2} + a u_{t+1} + b u_t = 0$$

may or may not produce oscillations, but even in the latter case it has been shown that the combination of a non-oscillating structure and a stream of random disturbances can produce plausible-looking oscillations.⁵ Attention, however, has been concentrated mainly upon those structures of type (1.2) which give rise to damped oscillations in the absence of any disturbance, the effect of the disturbance being to continually regenerate the oscillations. The family of a, b values which give rise to damped oscillations in (1.2) is defined by the double condition

$$(1.3) \quad a^2 < 4b; \quad 0 < b < 1.$$

The periodicity of a series generated by (1.2) may then be measured in three different ways. Defining a peak as any value of the series greater than both neighbouring values and an upcross as a negative value of the series succeeded by a positive value, we may compute for any series the mean distance between peaks and the mean distance between upcrosses. The

⁴M. G. Kendall. "Oscillatory Movements in English Agriculture," *Journal of the Royal Statistical Society*, 1943, pp. 104-6.

^{4a}G. U. Yule, "On a Method of Investigating Periodicities in Disturbed Series, with special reference to Wolfer's sunspot numbers," *Philosophical Transactions of the Royal Society*, A226, 267. The properties of the second order linear scheme and its possible applications to economic series have been thoroughly explored by Kendall. From the economist's point of view his most interesting works are "On Autoregressive Time Series," *Biometrika*, 33, 105; "Oscillatory Movements in English Agriculture," *Journal of the Royal Statistical Society*, 106, 91, and the monograph on Oscillatory Time Series.

⁵See T. Haavelmo, "The Inadequacy of Testing Dynamic Theory by comparing Theoretical Solutions and Observed Cycles," *Econometrica*, 1940, pp. 312-321.

expected values of these statistics when the disturbance term is distributed normally and independently about mean zero with constant variance are then⁶

$$(1.4) \quad \text{m.d. (peaks)} = 2 \pi / \cos^{-1} \left\{ \frac{b^2 - (1 + a)^2}{2(1 + a + b)} \right\}$$

$$(1.5) \quad \text{m.d. (upcrosses)} = 2 \pi / \cos^{-1} \left\{ \frac{-a}{1 + b} \right\}$$

It will be seen that these statistics depend solely upon the constants a and b of the autoregressive scheme, and not at all upon the variance of the disturbance term.

A third measure of periodicity is the autoregressive period, which is defined by

$$(1.6) \quad \text{Autoregressive period} = 2 \pi / \cos^{-1} \left\{ \frac{-a}{2\sqrt{b}} \right\}$$

This is the *constant* period of the series generated by the homogeneous, second-order difference equation (1.2), that is, the period that the series (1.1) would display if there were no disturbance.

(b) *Econometric approach.*

The basic distinction between the econometric and the more narrowly mathematical or statistical approach to the analysis of economic time series is that the former considers, not any single series in isolation, but rather the inter-relations between series. This measurement of the inter-relations between series involves two steps. The first is the specification of a set of relationships, often linear, between current and lagged values of the various endogenous and exogenous variables: the endogenous variables are those for whose behaviour an explanation is sought and the exogenous those whose values are taken as determined outside the particular field being studied. The latter are presumed to influence the former, but any causal influence in the opposite direction is ruled out. The specification of which variables enter which relations and with

⁶M. G. Kendall, *Contributions to the Study of Oscillatory Time Series*, Chapter 6.

what lags is usually made with the assistance of economic theory. The second step in the econometric approach is the estimation of the parameters in the set of relationships from statistical data for some given time period. The fit of the model to this period may be examined and conditional predictions made of future values of the endogenous variables, to be tested against the actual values as they materialise.

(c) *Empirical approach.*

The outstanding example of the empirical approach in the analysis of cyclical fluctuation is that adopted by the National Bureau of Economic Research in their extensive measurement and classification of the "facts" of cyclical experience, gleaned from more than one thousand individual time series.⁷ This is not to say that the National Bureau approach is either non-theoretical or anti-theoretical. Their methods follow from a firmly held view on the proper roles of "facts" and "theory" in economic investigation, and there is a two-fold relationship of their work to theory. The first aspect of this relationship is the theoretical foundation for their methods of measurement. Any method for the statistical analysis of time series has meaning and significance only in relation to some underlying theoretical conception of the working of the economic process, and this is of vital importance when the object of the analysis is to separate out and measure one component of economic development. The National Bureau view of the interactions of trend, cycle, seasonal and erratic elements has led to their own distinctive, statistical approach to the analysis of economic time series.

The second aspect of the relationship of their empirical work to theory is that they regard the fact gathering as an essential preliminary to the construction of an adequate theory. In the words of Burns and Mitchell :

"Our theoretical work leans heavily on cyclical averages . . . instead of starting out from the dreamland of equilibrium, or from a few simple assumptions that commonsense suggests about the condition of business in late 'prosperity' or

⁷A comprehensive account of the National Bureau methods is given in Burns and Mitchell, *Measuring Business Cycles*.

depression,' as is the usual procedure of business-cycle theorists, we start our theoretical analysis with cyclical averages; in other words, our 'assumptions' are derived from concrete systematic observations of economic life."⁸

Whether or not every reader accepts the statistical foundations of the National Bureau's methods, their work represents the most ambitious attempt yet made to chart "the recurrent fluctuations in economic fortune that modern nations experience."

It is the purpose of this paper to bring together those three approaches to the analysis of economic time series in order to test certain implications of econometric models and also to see whether there are significant divergences in the cyclical experience of different sectors of the economy.

II. ECONOMETRIC MODELS AND THE ELIMINATION PROCESS.

(a) *Implications of linear econometric models for the average duration of cycles.*

The pioneering attempts at econometric model construction have relied heavily on linear relationships and these have frequently been found to give adequate approximations to the empirical data. A linear model is complete when it has as many independent relations as endogenous variables, and the system may then be solved and a difference equation obtained for each endogenous variable. Orcutt has shown that for linear systems in general the coefficients of this difference equation will be the *same* for *each* endogenous variable in the system.⁹

This point is fundamental to our analysis and may be illustrated with one of Tinbergen's simple expository systems.

$$(2.1) \quad V_t = \beta Z_{t-1} + v_t$$

$$(2.2) \quad U_t = L_t + \epsilon_1 Z_{t-1} + \epsilon_2 (Z_{t-1} - Z_{t-2}) + u_t$$

$$(2.3) \quad Z_t = U_t + V_t - L_t$$

where V = investment, Z = non-labour income, U = consumption outlay, L = wages, all in deviation form, and u and

⁸Burns and Mitchell, *op. cit.* p. 491.

⁹G. H. Orcutt, "A Study of the Autoregressive Nature of the Time Series Used for Tinbergen's Model of the Economic System of the United States, 1919-1932" *Journal of the Royal Statistical Society, Series B*, 1948, pp. 2-6.

v are disturbances. This may be regarded as a system in the three endogenous variables Z_t , V_t , and $(U_t - L_t)$. Solving for these variables we obtain :—

$$(2.4) \quad Z_t - (\beta + \epsilon_1 + \epsilon_2) Z_{t-1} + \epsilon_2 Z_{t-2} = \eta_{1t}$$

$$(2.5) \quad V_t - (\beta + \epsilon_1 + \epsilon_2) V_{t-1} + \epsilon_2 V_{t-2} = \eta_{2t}$$

$$(2.6) \quad (U_t - L_t) - (\beta + \epsilon_1 + \epsilon_2) (U_{t-1} - L_{t-1}) + \epsilon_2 (U_{t-2} - L_{t-2}) = \eta_{3t}$$

where the disturbances η are linear combinations of u and v . The model defined by equations (2.1) to (2.3) thus implies that each of the endogenous variables follows a second-order autoregressive scheme with the *same* coefficients, though the properties of the disturbance terms on the right-hand side of the final equations (2.4) to (2.6) will not usually be identical.

If there were no disturbances v and u in (2.1) and (2.2) then the η 's would disappear from (2.4) to (2.6) and the model would imply that, if the variables oscillated at all, then all three would display an *identical* and *constant* periodicity. Since, however, (2.1) and (2.2) are behaviour relations it is essential to incorporate a disturbance term in each; in this case the η 's will not vanish, but if it could be assumed that each η had zero autocorrelations then it would follow from page 196 above that each endogenous variable should display the same periodicity, as measured either by m.d. (peaks) or m.d. (upcrosses), since the constants of the three autoregressive schemes are the same. The η 's however, are unlikely to behave as independent time series and this for two reasons. Firstly, in the above model the η 's are given by

$$(2.7) \quad \eta_{1t} = u_t + v_t$$

$$(2.8) \quad \eta_{2t} = u_{t-1} + v_t - (\epsilon_1 + \epsilon_2) v_{t-1} + \epsilon_2 v_{t-2}$$

$$(2.9) \quad \eta_{3t} = u_t - \beta u_{t-1} + (\epsilon_1 + \epsilon_2) v_{t-1} - \epsilon_2 v_{t-2}$$

so that, even if u_t and v_t each have zero autocorrelations and there is no serial correlation between them, η_2 will in general have the first two autocorrelation coefficients non-zero, η_3 its first autocorrelation non-zero, and only η_1 will be independent over time. Secondly, if the original model embraced exogenous variables, then solving for the endogenous variables would give a disturbance term in each final equation which was a composite of the disturbances in the initial equations and the exogenous

variables and, since the latter are likely to be autocorrelated, so will this composite.

In his study *Business Cycles in the U.K. 1870-1914* Tinbergen has a system of 45 initial (elementary) equations involving about 100 parameters (elasticities, marginal propensities, etc.). This system is not perfectly linear and so its solution is difficult, but by a series of approximations Tinbergen solves for non-labour income (Z) and obtains a second-order autoregressive scheme

$$(2.10) \quad Z = 1.27 Z_{-1} - 0.60 Z_{-2} + \epsilon$$

where the time unit is 0.7 years. Klein's simple three equation model for U.S.A. reduces exactly to a third order autoregressive equation in each endogenous variable, where the time unit is a year.¹⁰ Tinbergen's model for U.S.A. reduces to a fourth-order autoregressive equation, again with a composite disturbance and a time unit of a year.¹¹

In both the Tinbergen and Klein models for U.S.A. the coefficients of the first two terms in the autoregressive equation are substantially greater than those of the remaining terms. A similar though less pronounced effect is found in Kalecki's model for U.S.A. which reduces to a fifth-order autoregressive scheme, with the coefficient of the fourth term zero.¹² Finally we may note that Orcutt concluded that the economic time series used in Tinbergen's study of U.S.A. 1919-1932 might be considered as random drawings from the population of series generated by the second-order autoregressive scheme,¹³

$$(2.11) \quad u_{t+2} - 1.3 u_{t+1} + 0.3 u_t = \epsilon_{t+2}$$

In summary then we may say that if there is any stability in the economic structure and if this type of predominantly linear econometric model gives a good approximation to that structure, we should expect to find something approaching *constant* mean distance between peaks in actual time series. This result holds for a linear system of any order, and is not restricted only to one which reduces to a second-order autoregressive scheme for each endogenous variable. We must

¹⁰*Economic Fluctuations in the United States*, pp. 58-80, and, in particular, equation (3.1.42) on p. 76.

¹¹*Statistical Testing of Business Cycle Theories*. Vol. II, pp. 126-165.

¹²*Theory of Economic Dynamics*. Chapters 11 and 12.

¹³Orcutt. *op. cit.*, p. 35.

next examine whether any empirical information on mean distance between peaks is obtainable in a suitable form from the work of the National Bureau.

(b) Reconciliation of criteria used in theoretical and empirical work.

The major difficulty in examining empirical data on cycle length to see whether this theoretical expectation of constant mean distance between peaks is sustained or not is that "peak" means something very different to theoretical workers on time series analysis and the analysts of actual series at the National Bureau. To the former u_t is a peak if $u_{t-1} < u_t > u_{t+1}$. The latter work mainly with monthly or quarterly series and the marking of peaks and troughs is a highly subjective procedure. The first stage is the demarcation of specific cycles in each deseasonalised series. Next comes the dating of the turning points.

"Intermediate between the persistent drifts that often cover decades and the oscillations that occur every few months, there appears in most series well-defined movements of rise and fall, the duration of which from trough to trough or from peak to peak is rarely less than two or more than seven years. These fluctuations varying in duration 'from more than one year to ten or twelve years' are our specific cycles."¹⁴

"Once the specific cycles have been distinguished we proceed to date their turning points. When the cycles are clear in outline, our practice is to take the lowest and highest points of the plotted curves as the dates of the cyclical turns. When the crests or troughs are 'flat,' the latest month in the horizontal zone is chosen as the turning date. The chief difficulties arise when erratic movements are prominent in the vicinity of a cyclical turn. Then we examine the several competing peaks or troughs to determine whether they are due to inadequate seasonal correction. That question settled, let us say for the peaks, we compare the average levels of several months centred on each potential peak and select as the actual peak the highest point in the cluster having the highest average level. If the averages of several clusters are approximately the

¹⁴Burns and Mitchell. *op. cit.*, p. 51.

same, we give preference to the highest point in the latest cluster, provided the movement in the period spanning the multiple peaks is not clearly downward. Finally, if the series is especially choppy in the turning zone, moving averages are used to help determine the month of the peak or trough."¹⁵

Thus for each series analysed by the National Bureau it is possible to measure the duration of each specific cycle and hence to compute the *average duration of specific cycles* for each series. Can these statistics of average duration be used to check on the theoretical expectation of constant mean distance between peaks?

There are two difficulties in doing so. The first and minor one is that by the average duration of specific cycles the National Bureau in fact mean the average distance between troughs whereas formula (1.4) refers to the average distance between peaks. This does not matter, however, as formula (1.4) in fact also holds for the mean distance between troughs. The second and major difficulty is the two different meanings of the term "peak" referred to above. A way out of the dilemma may be found by noticing that most of the econometric models used to date are based on annual data so that the unit of time for the resultant autoregressive equation is one year. Suppose that we take a monthly or quarterly series already analysed by the National Bureau, sum it by, say, calendar years and apply the mechanical definition of peaks and troughs as relative maxima and minima. How would the resultant m.d. (peaks) and m.d. (troughs) compare with the values for these statistics given by the National Bureau method?

It is possible to examine this question for the two original series given in full in "Measuring Business Cycles," namely Coke Production, U.S.A. (monthly) 1914-33¹⁶ and Bituminous Coal Production, U.S.A. (monthly) 1905-1939.¹⁷ The results are shown in Table I. For the coke production series the number and dating of peaks and troughs by the two methods agree with the sole exception of the first National Bureau trough of November, 1914, since the first item in the annual

¹⁵*ibid.* p. 58. See also the detailed description on p. 64 of the methods employed to resolve any differences in the datings chosen independently by different workers.

¹⁶*Measuring Business Cycles.* p. 25.

¹⁷*ibid.* p. 59.

series cannot be classified as a turning point. For the bituminous coal production series the numbers of peaks and troughs are identical and the timing agrees with the two exceptions of a National Bureau peak of March, 1927, which is put in 1926 by the annual data and a National Bureau trough of December 1927, which is put in 1928 by the annual data.

TABLE I
COMPARISON OF PEAKS AND TROUGHS IN TWO ANNUAL SERIES WITH THOSE DETERMINED BY THE NATIONAL BUREAU FROM THE MONTHLY DATA

Calendar Year	COKE PRODUCTION U.S.A.			BITUMINOUS COAL PRODUCTION U.S.A.		
	Production (thousands of short tons)	Relative Maxima (P) and Minima (T)	National Bureau Peaks and Troughs	Production (millions of short tons)	Relative Maxima (P) and Minima (T)	National Bureau Peaks and Troughs
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1905				315.0		
1906				342.7		
1907				395.0	P	P. May 1907
1908				332.3	T	T. Jan. 1908
1909				378.5		
1910				417.5	P	P. June 1910
1911				405.0	T	T. Feb. 1911
1912				450.7		
1913				478.2	P	P. Oct. 1913
1914	34,584		T. Nov. 1914	422.4	T	T. Nov. 1914
1915	41,601			440.4		
1916	54,576			502.7		
1917	55,656			552.6		
1918	56,527	P	P. July 1918	580.4	P	P. July 1918
1919	44,235	T	T. May 1919	463.2	T	T. Mar. 1919
1920	51,384	P	P. Aug. 1920	567.3	P	P. Dec. 1920
1921	25,295	T	T. July 1921	414.3		
1922	37,021			410.9	T	T. July 1922
1923	57,057	P	P. May 1923	572.4	P	P. May 1923
1924	44,280	T	T. July 1924	480.9	T	T. June 1924
1925	51,370			519.4		
1926	56,936	P	P. Feb. 1926	573.4	P	P. Mar. 1927
1927	51,135	T	T. Nov. 1927	516.9		T. Dec. 1927
1928	52,844			501.4	T	
1929	59,955	P	P. July 1929	537.1	P	P. May 1929
1930	48,036			469.8		
1931	33,514			384.8		
1932	21,799	T	T. Aug. 1932	306.4	T	T. July 1932
1933	27,646			335.3		
1934				360.0		
1935				370.7		
1936				438.1		
1937				444.7	P	P. Mar. 1937
1938				341.8	T	T. Mar. 1938
1939				382.3		

The comparison between the average duration of the cycles given by the two methods is shown in Table II.

TABLE II
COMPARISON OF THE MEAN DISTANCES BETWEEN PEAKS AND
TROUGHES GIVEN BY ANNUAL AND MONTHLY DATA.

				Annual data	National Bureau (monthly data)
Coke ... ..	...	...	m.d. (Peaks) years	2.75	2.75
Production ... ..	...	...	m.d. (Troughs) „	3.25	3.55
Bituminous Coal ... ..	...	...	m.d. (Peaks) years	3.75	3.73
Production ... ..	...	...	m.d. (Troughs) „	3.75	3.77

For these two series there is a remarkably good agreement between the mean distances given by the mechanical demarcation of cycles in annual data and the subjective methods of the National Bureau applied to the monthly data. Similar experiments were carried out on a larger sample of series at the National Bureau and two methods tried of demarcating specific cycles in the annual data, the mechanical method, and a second subjective method of treating "every rise or fall as cyclical, except when it is well below the typical range of movements characteristic of the series."¹⁸

The following conclusion was reached :—

" . . . in series with slight or no erratic movements the 'mechanical' method is superior to ours in that it tends to make the average duration of specific cycles approach more closely the average yielded by monthly data. When a series is characterised by erratic movements that are violent relative to the cyclical movements, numerous changes in annual data may not be cyclical : so that the mechanical method may yield poorer estimates of both the average duration and the average amplitude of specific cycles."¹⁹ It seems, therefore, that for the majority of series the National Bureau measurements of the average duration of specific cycles will be very close to the mean distance between troughs in the annual series, where a trough is defined simply as a relative minimum, and so this valuable

¹⁸*Measuring Business Cycles.* p. 215.

¹⁹*ibid.* footnote p. 216.

collection of data may be made to provide a check on the theoretical expectation of approximately constant mean distance between peaks (or troughs) in the majority of series.

(c) *National Bureau findings on the Average Duration of Specific Cycles.*

Tables III and IV present some unpublished data on the average specific cycle durations of 794 American monthly and quarterly series.²⁰ In Table III the major percentiles are given for the frequency distribution of average specific cycle durations for all 794 series, and Table IV shows the extreme values and the quartiles for various sub-groups of series, the grouping being by the type of activity to which the series relates. Diagram IIa also pictures* the frequency distribution of Table III. The two dominating features of the tables are (1) the concentration of all median values but one in the 40-49 months range and (2) the fairly substantial dispersion about the median value in all groups with the single exception of the Hours series. This spread of the average specific cycle durations in the sub-groups and in the combined group conflicts with the theoretical expectation of approximately constant average duration.

TABLE III

MAGNITUDE AND VARIABILITY OF AVERAGE SPECIFIC CYCLE DURATIONS OF 794 AMERICAN MONTHLY AND QUARTERLY SERIES

Percentiles			(months)	Percentiles			(months)
Lowest Value	...	...	22.7	55th percentile	...	...	44.8
5th percentile	...	...	31.4	60th	..	...	45.8
10th	..	...	34.0	65th	..	...	47.5
15th	..	...	36.2	70th	..	...	49.2
20th	..	...	38.0	75th	..	(3rd Quartile)	52.5
25th	..	(1st Quartile)	39.2	80th	..	...	55.2
30th	..	...	40.2	85th	..	...	58.1
35th	..	...	41.3	90th	..	...	65.6
40th	..	...	42.0	95th	..	...	73.1
45th	..	...	43.0	Highest value	...	...	171.0
50th	..	Median	43.8				

Interquartile Range 13.3 months

Relative Interquartile Range 30%

²⁰I am very grateful to Dr. G. H. Moore of the National Bureau of Economics Research for providing these figures, which were taken from an unpublished manuscript by Dr. Wesley C. Mitchell.

*Diagram I has not been printed.

It is true that the National Bureau collection of series probably includes many which could not normally be fitted into any linear econometric model, such as controlled prices and other "administered" variables, but these are presumably only a small proportion of the whole and would not of themselves account for the spread of the average duration figures. Do the National Bureau data then cast serious doubt on the general applicability of linear econometric models to give an adequate representation of the economic process? On this test the discrepancy between theoretical expectation and the empirical findings appears to do so.

TABLE IV

MAGNITUDE AND VARIABILITY OF AVERAGE SPECIFIC CYCLE DURATIONS FOR VARIOUS GROUPS OF AMERICAN MONTHLY AND QUARTERLY SERIES

Group (1)	No. of Series (2)	Lowest Value (months) (3)	First Quartile (months) (4)	Median (months) (5)	Third Quartile (months) (6)	Highest value (months) (7)	Relative Inter- quartile Range % (8)
Foods and Farm Products	120	26.1	43.0	49.2	58.4	140.0	31
Other non-durable Goods	178	22.7	36.3	41.8	52.2	171.0	38
Durable Goods	209	24.0	41.2	44.6	54.1	122.0	29
Inventories	61	25.6	34.6	40.6	49.4	65.0	36
Finance	157	26.2	38.7	43.2	48.8	164.0	23
Production	253	22.7	39.6	43.4	52.8	151.0	30
Prices	141	31.2	42.0	47.6	56.2	140.0	30
Trade	74	24.0	39.0	45.3	58.3	131.0	43
Employment	42	22.9	32.2	42.0	47.7	80.5	37
Payrolls	30	23.9	32.2	43.6	54.3	143.0	51
Wage Rates... ..	7	39.0	46.6	95.8	116.0	129.0	72
Hours	9	34.5	44.5	45.0	46.0	48.3	3
Earnings	10	26.0	35.5	42.0	43.7	71.0	20
Business Activity ..	10	36.6	38.5	43.2	43.5	46.4	12

DIAGRAM IIa

DISTRIBUTION OF AVERAGE SPECIFIC CYCLE DURATIONS

FOR 794 AMERICAN MONTHLY AND QUARTERLY SERIES.

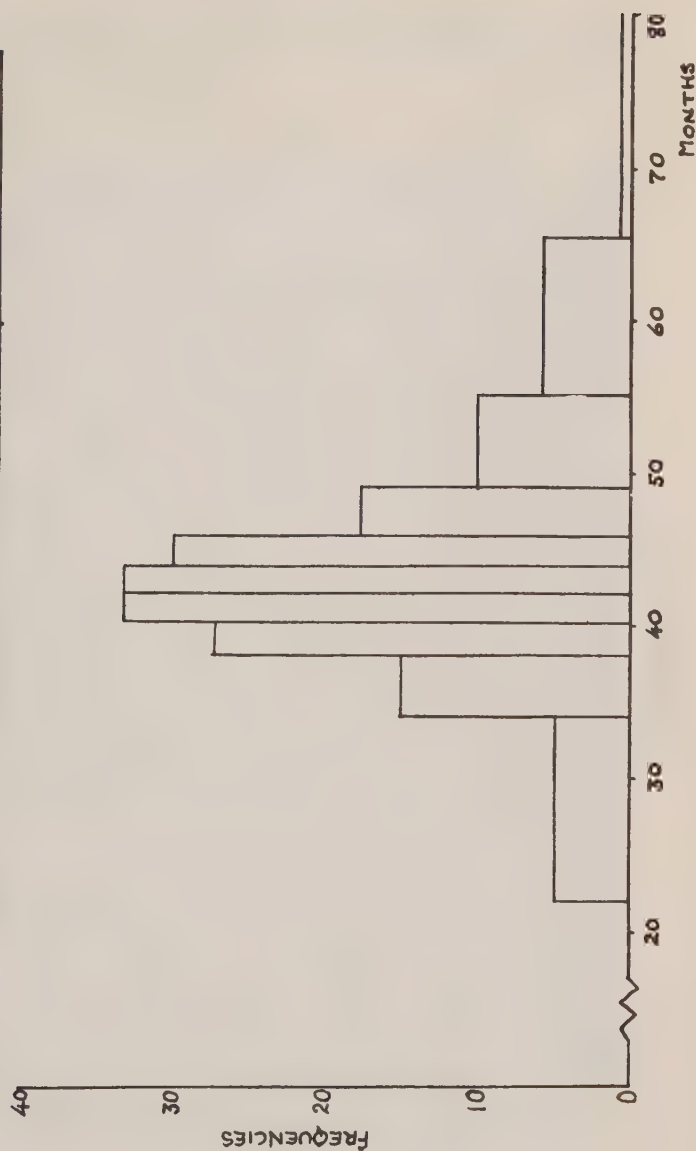
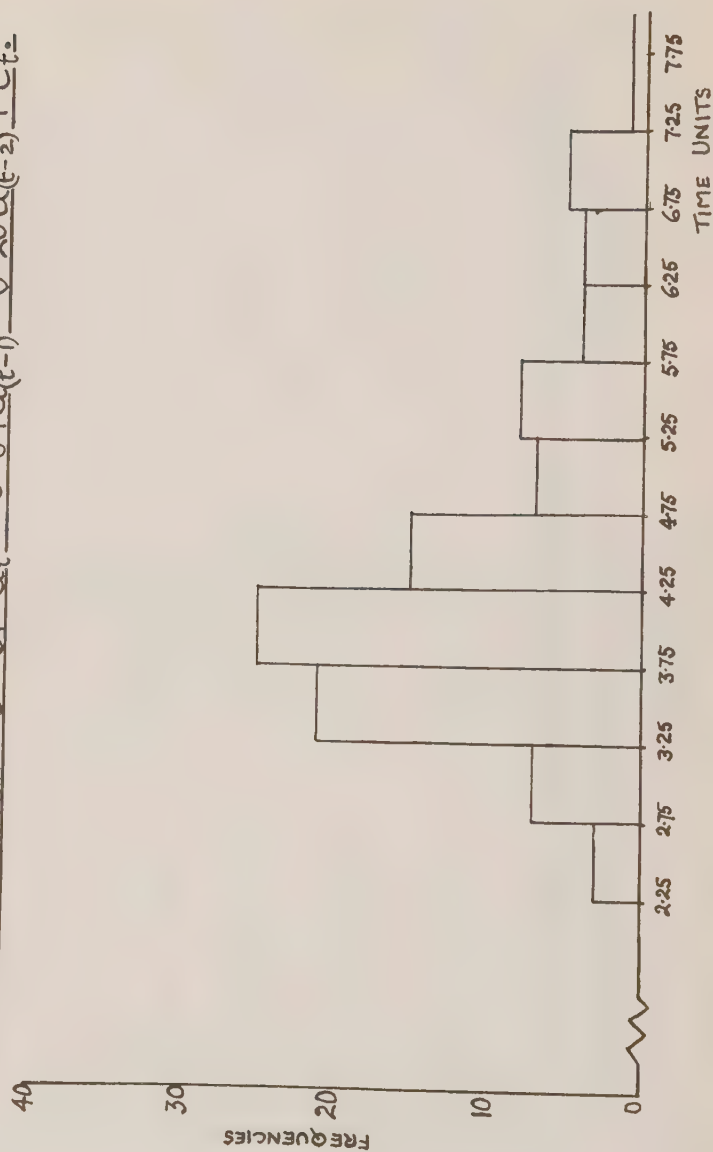


DIAGRAM II BDISTRIBUTION OF m.d.(peaks) IN 100 SUB-SERIES FROM500 TERMS GENERATED BY $u_t = 0.89u_{(t-1)} - 0.20u_{(t-2)} + \varepsilon_t$.

The next section is devoted to an examination of some aspects of the discrepancy, and it remains to be seen whether it supports this initial conclusion.

III. EXAMINATION OF SOME QUESTIONS SUGGESTED BY THE DISCREPANCY BETWEEN THEORETICAL EXPECTATION AND EMPIRICAL FINDINGS.

There are three main points which require further examination before one can safely conclude that the empirical data on average cycle length point to a serious inadequacy of linear econometric models. Firstly, the effect of an autocorrelated disturbance term in any given autoregressive scheme upon the expression for m.d. (peaks) must be examined, since the "final" equations of an econometric model may well have the *same* coefficients but disturbance terms with different autocorrelation properties. Secondly, the theoretical expression for m.d. (peaks) is an expected value, or in other words the value which holds for an infinitely long time series, but the empirical averages come on the whole from fairly short time series, so that the problem of sampling variations in m.d. (peaks) must be examined. Thirdly, linear econometric models may well give a good representation of an economic structure at a given moment of time, but such structures may be liable to frequent changes. Before looking at these problems, however, it is desirable to explore more fully the connection between autoregressive structure and mean distance between peaks.

(a) *Connection between autoregressive structure and the average duration of cycles.*

We confine attention here to linear, second-order autoregressive schemes, since schemes of higher order are difficult to handle mathematically and there is empirical evidence that second-order schemes frequently give a good fit to economic series. It is commonly thought that m.d. (peaks) for the scheme (1.1) is "extraordinarily insensitive to variations in a and b ."²¹ It is easy, however, to bring out precisely the variation in m.d.

²¹See M. G. Kendall, *Contributions to the Study of Oscillatory Time Series* p. 57 where four values of m.d. (peaks) are given in support of this statement.

(peaks) associated with different values of the constants in the autoregressive scheme by noting that there is an obvious factorisation in the formula (1.4) which enables us to rewrite it as

$$(3.1) \quad \text{m.d. (peaks)} = 2\pi / \cos^{-1} \left\{ \frac{k-1}{2} \right\}$$

where

$$(3.2) \quad k = b - a$$

Thus the periodicity of the series, as measured by m.d. (peaks) depends only on the *difference* between the constants of the autoregressive scheme. The relationship is depicted in the top section of Diagram III with m.d. (peaks) on the vertical scale and k on the horizontal. The initial flat region of the curve shows how substantial variations in k produce very little change in m.d. (peaks).

The relationship (3.2) for any given value of k defines a straight line

$$a = b - k$$

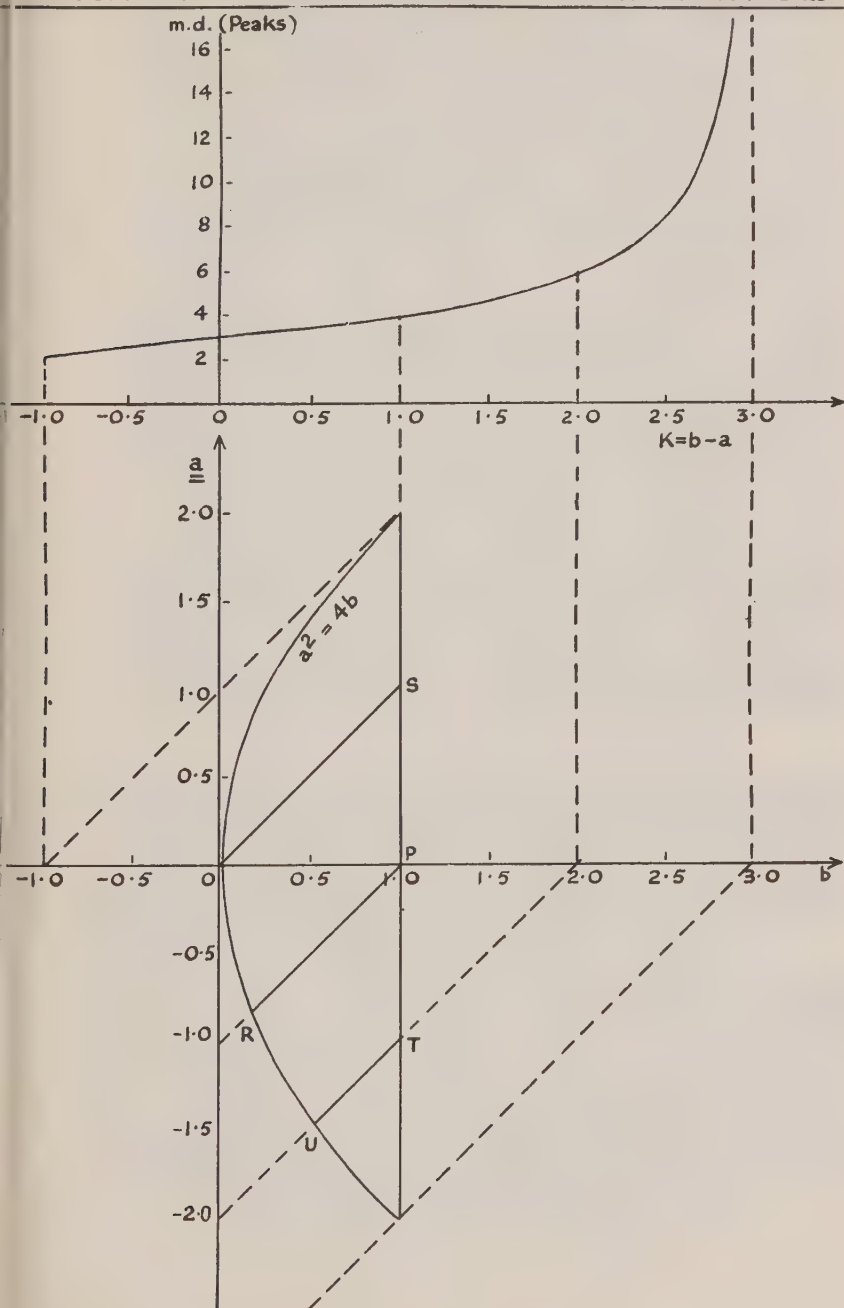
in the a, b plane with slope unity and intercept k on the b axis. Further, the double condition (1.3) on the a, b , values defines the saucer-shaped region in the a, b plane shown in the bottom section of Diagram III. All pairs of a, b , values which would, on substitution in (1.2), give rise to damped oscillations are contained in this region. With the aid of Diagram III one can then show graphically all pairs of a, b values which will give rise to autoregressive series with the *same* m.d. (peaks). For example, m.d. (peaks) = 4 corresponds to $k = 1$ and all a, b values on the line PR in the bottom section of Diagram III have this value of k and hence a m.d. (peaks) equal to 4. In a similar way one can see that all a, b , values lying in the region OSPTURO will generate series with m.d. (peaks) in the range 3 to 6.

An interesting question then is to ask what the probability distribution of the variate, m.d. (peaks), would be like if one assumed that all pairs of a, b values in the saucer-shaped domain were equally likely. If we let y denote m.d. (peaks) then the probability distribution of y is

$$(3.3) \quad f(y) = \frac{6\pi}{y^2} \left(\sin \frac{2\pi}{y} \right) \left(\cos \frac{\pi}{y} \right) \left(1 - \cos \frac{\pi}{y} \right) \quad y \geq 2$$

DIAGRAM 111

MEAN DISTANCE BETWEEN PEAKS IN SERIES GENERATED BY SECOND ORDER SCHEMES



This is a positively skewed distribution with an expected value of about 4 time units and a standard deviation of about 1.6 time units. An interesting theoretical curiosity is that the frequency distribution of the durations of business cycles in U.S.A. over the period 1796 to 1923, given in W. C. Mitchell, *Business Cycles* (1927) p. 388, has a mean of 4 years and a standard deviation of 1.8 years. If the theoretical distribution (3.3) is fitted to Mitchell's data by assuming the time unit to be one year, the discrepancies between the theoretical and the empirical frequencies are not great enough to exceed the conventional 5% significance level on the usual χ^2 test. But this is not a comparison of like with like, as Mitchell's data relate to the lengths of individual business cycles while the theoretical distribution relates to the *average* duration of specific cycles. A more valid comparison, however, is to contrast the distribution (3.3) with the empirical distributions of average cycle duration given in Tables III and IV.

The fit to the overall distribution for the 794 series is poor, the empirical distribution being less strongly skewed than the theoretical; and of the first five sub-groups in Table IV, the theoretical distribution gives a reasonable fit to two, but not to the other three. The agreement is closest for the Inventories group and less good for Other non-Durables, as is shown in Table V.

TABLE V

COMPARISON OF THEORETICAL AND EMPIRICAL DISTRIBUTION OF AVERAGE CYCLE DURATION IN TWO GROUPS OF SERIES

	Inventories			Other non-durables		
	Position Values (months)	Theoretical frequencies	Actual frequencies	Position Value (months)	Theoretical frequencies	Actual frequencies
First Quartile ...	34.6	15.7	15.25	36.3	57.3	44.5
Median ...	40.6	13.2	15.25	41.8	33.5	44.5
Third Quartile ...	49.4	13.4	15.25	52.2	39.2	44.5
	...	18.7	15.25	...	48.0	44.5
	...	61	61	...	178	178
	$\chi^2 = 1.27$			$\chi^2 = 7.04$		

($\chi^2 = 7.8$ at 5% level for 3 degrees of freedom)

It is possible to obtain apparently good fits of this theoretical distribution to various other sub-groups of the 794 series but I do not think this approach should be pushed too far until the other three questions mentioned above have been examined. To summarise this section the following points may be made.

(1) The underlying hypothesis is the complete antithesis of the result of the econometric school, since it involves the consideration of all possible second-order schemes rather than a single one.

(2) There seems no pressing reason other than that of simplicity for postulating a uniform distribution of a , b values. Other assumptions could produce theoretical distributions for m.d. (peaks) which would give better approximations to those empirical distributions which the first distribution did not fit. But all variants of this approach imply drawings from a population of second-order schemes and not just a single one.

(3) There are some difficulties about the use of the χ^2 test, since this usually requires the assumption that the theoretical frequencies are fixed, whereas the form in which the data were available here requires us to have the theoretical frequencies varying and the empirical frequencies constant. It can be shown, however, that the expression used approximates to χ^2 as the number of series in the group increases.

(4) The most serious defect of the approach of this section, and one which I think undermines it is that the theoretical distribution refers to the m.d. (peaks) to be found in infinitely long series while the empirical data only contain sample approximations to these statistics. This might not be too serious if the sampling variation in this statistic is small, but the point will be taken up in section (c) below.

(b) Effect of autocorrelation of residuals upon mean distance between peaks.

If r_1 and r_2 denote the first two autocorrelations of the series u_t given by the second-order, linear, autoregressive scheme (1.1)

$$u_{t+2} + a u_{t+1} + b u_t = \epsilon_{t+2}$$

and if ϵ has a normal distribution then the mean distance between peaks in the u_t series is given by²²

$$(3.4) \quad \text{m.d. peaks} = 2\pi / \cos^{-1}\delta$$

where

$$(3.5) \quad \delta = \frac{-1 + 2r_1 - r_2}{2(1 - r_1)}$$

This result does not depend upon the independence in time of the ϵ series, but if this additional condition holds then (3.5) may be written

$$(3.6) \quad \delta = \frac{b^2 - (1 + a)^2}{2(1 + a + b)} = \frac{(b-a) - 1}{2}$$

and so we have the formulae (1.4) and (3.1) given earlier.

The problem of examining the effect of autocorrelation of the ϵ series upon m.d. (peaks) for any given values of a and b can then be tackled by examining its effects upon the first two autocorrelations of the u 's, namely r_1 and r_2 .

We may firstly write (1.1) in the alternative form

$$(3.7) \quad u_\tau = \epsilon_\tau - a \epsilon_{\tau-1} + (a^2 - b) \epsilon_{\tau-2} + \text{terms in } \epsilon_{\tau-3}, \epsilon_{\tau-4} \text{ etc.}$$

Multiplying corresponding sides of (1.1) and (3.7) and taking expected values we have

$$(3.8) \quad E(u_{t+2} u_\tau) + a E(u_{t+1} u_\tau) + b E(u_t u_\tau) = E(\epsilon_{t+2} \epsilon_\tau) - a E(\epsilon_{t+2} \epsilon_{\tau-1}) + (a^2 - b) E(\epsilon_{t+2} \epsilon_{\tau-2}) \text{ plus terms in } E(\epsilon_{t+2} \epsilon_{\tau-3}) \text{ etc.}$$

Let ρ_k denote the k th autocorrelation coefficient of the ϵ 's and let us assume that

$$(3.9) \quad \begin{cases} \rho_k \neq 0 & k = 1, 2 \\ \rho_k = 0 & k = 3, 4, \dots \end{cases}$$

Putting $\tau = t+1$ in (3.8) we then have

$$\{r_1(1+b) + a\} \text{ var } u = (\rho_1 - a\rho_2) \text{ var } \epsilon$$

which may be solved for r_1 to give

$$(3.10) \quad r_1 = \frac{(\rho_1 - a\rho_2) (\text{var } \epsilon / \text{var } u) - a}{1 + b}$$

²²See M. G. Kendall, *Contributions to the Study of Oscillatory Time Series*, pp. 55, 56.

Similarly, putting $\tau = t$ in (3.8) we may solve the resultant expression for r_2 and obtain

$$(3.11) \quad r_2 = \rho_2 (\text{var } \epsilon / \text{var } u) - a r_1 - b$$

Substituting (3.10) and (3.11) into (3.5) we obtain an expression for δ in terms of a , b , ρ_1 , ρ_2 and the ratio of the variance of ϵ to the variance of u , that is

$$(3.12) \quad \delta = \frac{b^2 - (1+a)^2 + (2+a)\rho_1(\text{var } \epsilon / \text{var } u) - \{(1+a)^2 + b\}\rho_2(\text{var } \epsilon / \text{var } u)}{2 \{1 + a + b - \rho_1(\text{var } \epsilon / \text{var } u) + a\rho_2(\text{var } \epsilon / \text{var } u)\}}$$

It can be seen that this reduces to (3.6) for $\rho_1 = \rho_2 = 0$. This expression, however, cannot be used as it stands for evaluating the effect upon δ , and hence upon m.d. (peaks) of variations in ρ_1 and ρ_2 , because the ratio of the variance of ϵ to that of u itself depends upon these two autocorrelation coefficients. This may be seen by remembering that, for sufficiently large values of t the solution of (1.1) is

$$(3.13) \quad u_t = \sum_{j=0}^{\infty} \xi_j \epsilon_{t-j+1}$$

where ξ_j are the damped harmonic weights.

$$\xi_j = \frac{2}{\sqrt{4b - a^2}} (\sqrt{b})^j \sin(\theta j) \text{ and}$$

$$\theta = \sin^{-1} \frac{\sqrt{4b - a^2}}{2\sqrt{b}}$$

so that $\xi_0 = 0$, $\xi_1 = 1$, $\xi_2 = -a$, $\xi_3 = (a^2 - b)$, etc.²³

On assumption (3.9) we then have the result that

$$(3.14) \quad \text{var } u = \text{var } \epsilon \left\{ \sum_{j=1}^{\infty} \xi_j^2 + 2\rho_1 \sum_{j=1}^{\infty} \xi_j \xi_{j+1} + 2\rho_2 \sum_{j=1}^{\infty} \xi_j \xi_{j+2} \right\}$$

Substitution of (3.14) in (3.12) gives

$$(3.15) \quad \delta = \frac{a + \beta \rho_1 + \gamma \rho_2}{2(1 + m \rho_1 + n \rho_2)}$$

²³See M. G. Kendall, "On Autoregressive Time Series," *Biometrika*, 33, 105.

where

$$(3.16) \quad \left\{ \begin{array}{l} \alpha = \{b^2 - (1 + a)^2\} \sum_{j=1}^{\infty} \xi_j^2 \\ \beta = 2 \{b^2 - (1 + a)^2\} \sum_{j=1}^{\infty} \xi_j \xi_{j+1} + a + 2 \\ \gamma = 2 \{b^2 - (1 + a)^2\} \sum_{j=1}^{\infty} \xi_j \xi_{j+2} - (1 + a)^2 - b \\ l = (1 + a + b) \sum_{j=1}^{\infty} \xi_j^2 \\ m = 2 (1 + a + b) \sum_{j=1}^{\infty} \xi_j \xi_{j+1} - 1 \\ n = 2 (1 + a + b) \sum_{j=1}^{\infty} \xi_j \xi_{j+2} + a \end{array} \right.$$

The evaluation of the effect upon δ , and hence upon m.d. (peaks), of variations in ρ_1 and ρ_2 is tedious because of the calculations required to obtain satisfactory approximations to the values of the terms involving ξ . Table VI presents the results of calculations made for four autoregressive schemes, taking ξ_j as far as the twentieth term in each case, with three alternative sets of positive values for the autocorrelation coefficients.* The figures in the body of the Table give the value of m.d. (peaks), which is 3 time units for the first two schemes and 4 time units for the last two, when the disturbance term is fully random. It is seen that permitting the first two autocorrelations to take on positive values produces in general a rise in m.d. (peaks): this rise is larger in the second pair of schemes than in the first, and within each pair of schemes it is larger the greater the degree of damping in the scheme (the degree of damping being inversely proportional to \sqrt{b}).

It is difficult to generalise without performing more extensive calculations, but it seems most unlikely that this factor alone could bear the whole burden of accounting for the observed variation in m.d. (peaks), as shown, for example, in

*Mr. A. M. Walker of Manchester University has devised an alternative method of calculating $\text{var } \epsilon / \text{var } u$, which does not involve computing the ξ 's. His method has been used to check the results given in Table VI.

TABLE VI
THE EFFECTS OF AUTOCORRELATION OF THE DISTURBANCE TERM
UPON MEAN DISTANCE BETWEEN PEAKS

Autoregressive scheme $u_t + a u_{t-1} + b u_{t-2} = \epsilon_t$	Autocorrelation properties of ϵ_t			
	$\rho_1 = 0$	$\rho_1 = \frac{1}{2}$	$\rho_1 = \frac{2}{3}$	$\rho_1 = \frac{3}{4}$
	$\rho_2 = 0$	$\rho_2 = \frac{1}{4}$	$\rho_2 = \frac{1}{3}$	$\rho_2 = \frac{1}{2}$
$a = 0.36, b = 0.36$	3.00	3.21	3.59	3.59
$a = 0.64, b = 0.64$	3.00	3.08	3.31	3.31
$a = -0.19, b = 0.81$	4.00	4.26	4.47	5.15
$a = -0.51, b = 0.49$	4.00	4.79	5.33	6.04

Diagram IIA. If the general tendency of positive autocorrelations of ϵ is to produce increases in m.d. (peaks), then for this effect alone to produce a distribution like that shown in Diagram IIA, the basic or underlying autoregressive scheme would have to be such as to produce, in combination with a random disturbance, the lowest observed m.d. (peaks); but, as is shown by the first two rows of Table VI, the increase in m.d. (peaks) tends to be small when the initial m.d. (peaks) is itself small. Thus this factor probably accounts for only a part of the observed variation in m.d. (peaks).

(c) *Sampling variation in mean distance between peaks.*

The expression (1.4) for mean distance between peaks is an expected value, which will only be approximated closely in a very long time series. Table VII presents a frequency distribution of the number of years covered by 811 National Bureau monthly and quarterly series for U.S.A.

TABLE VII
PERIODS COVERED BY 811. U.S.A. MONTHLY AND QUARTERLY SERIES

Number of years covered	Approximate percentage of all series
Under 20	45
20-29	25
30-39	10
40-49	10
50-59	5
60-69	2
70-79	2
80 & over	1

(Based on Table 2 in "Measuring Business Cycles" p. 20).

Thus 45% of the National Bureau series cover less than 20 years, and about 70% cover less than 30 years. This raises the question of the possible extent of the sampling variation in mean distance between peaks. The requisite theoretical distribution has not yet been established, but the problem may be examined by sampling from a few artificially constructed series.

The first series used for this purpose was Kendall's Series I, given in his *Contributions to the Study of Oscillatory Time Series*. This is a series of 480 terms generated by the autoregressive scheme.

$$u_{t+2} = 1.1 u_{t+1} - 0.5 u_t + \epsilon_{t+2}$$

with the element ϵ taken from Babington Smith's and Kendall's Tables of Random Sampling Numbers. The expected m.d. (peaks) for this scheme on the assumption of a normally distributed random element is 4.96, and the observed value in the 480 terms based on a random element with a rectangular distribution is 5.05.

One hundred segments were selected at random from this series of 480 terms, the lengths of the segments being distributed in the proportions shown in Table VII; that is 45 segments covered 19 years each, 25 covered 25 years each, 10 covered 35 years each and so on. For each segment the m.d. (peaks) was computed and the results are shown in Table VIII.

TABLE VIII
DISTRIBUTION OF M.D. (PEAKS) IN 100 SEGMENTS FROM KENDALL'S SERIES I

m.d. (peaks)							Frequency
Under 3.25 time units							4
3.25 and under	4.25	"	"	...	...	...	20
4.25	"	5.25	"	...	...	...	36
5.25	"	6.25	"	...	...	...	22
6.25	"	7.25	"	...	...	...	12
7.25	"	8.25	"	...	...	...	5
8.25 and over	...	...	...	...	...	...	1
							100

It is clear that there is considerable sampling variation in m.d. (peaks). The mean of this distribution is 4.9 and the

relative interquartile range is 28% as compared with a value of 30% for the overall distribution for 794 U.S.A. series given in Table III. However, the empirical distributions in Tables III and IV show a much greater positive skewness than the distribution in Table VIII. This may be a sampling effect, or it may be that if we sampled from a series with a smaller m.d. (peaks) the resultant distribution would be positively skewed, in view of the bottom limit of 2 for m.d. (peaks). To test this latter effect, 500 terms were generated by the scheme

$$(3.17) \quad u_t = 0.89 u_{t-1} - 0.20 u_{t-2} + \epsilon_t$$

using a random normal disturbance with zero mean and unit variance. One hundred segments of varying lengths were again selected at random and m.d. (peaks) calculated for each segment. The resultant frequency distribution is given in Table IX and its histogram in Diagram IIB.

TABLE IX

DISTRIBUTION OF M.D. (PEAKS) IN 100 SEGMENTS FROM THE SERIES

$$u_t = 0.89 u_{t-1} - 0.20 u_{t-2} + \epsilon_t$$

m.d. (peaks)								Frequency
Under 2.75 time units								3
2.75 and	"	3.25	"	"	"	"	"	7
3.25	"	3.75	"	"	"	"	"	21
3.75	"	4.25	"	"	"	"	"	25
4.25	"	4.75	"	"	"	"	"	15
4.75	"	5.25	"	"	"	"	"	7
5.25	"	5.75	"	"	"	"	"	8
5.75	"	6.25	"	"	"	"	"	4
6.25	"	6.75	"	"	"	"	"	4
6.75	"	7.25	"	"	"	"	"	5
7.25 and over	"	"	"	"	"	"	"	1
								100

The expected m.d. (peaks) for the scheme (3.17) is 4.12 and the actual value in the 500 terms generated is 4.34. The median value for the frequency distribution in Table IX is 4.13, and the dispersion and skewness of this distribution are roughly of the same order of magnitude as those of the above empirical distributions.

This point is illustrated in Table X.

TABLE X
COMPARISON OF THE DISPERSION AND SKEWNESS OF THE
DISTRIBUTIONS IN TABLES III, IV AND IX

Distribution	Relative Interquartile Range %	Skewness
All 794 series (Table III)	30	0.31
Foods and farm products (Table IV) ...	31	0.19
Other non-Durable goods " ...	38	0.37
Durable Goods " ...	29	0.47
Inventories " ...	36	0.19
Finance " ...	23	0.11
Distribution of Table IX	34	0.28

NOTES: Q_1 = Lower Quartile. M_i = Median. Q_3 = Upper Quartile.
Relative interquartile range = $100(Q_3 - Q_1)/M_i$. Skewness = $(Q_1 + Q_3 - 2M_i)/(Q_3 - Q_1)$.

The distribution in Table IX has an even greater dispersion than the overall distribution for the 794 U.S.A. series. Thus it would seem that the sampling variation in m.d. (peaks) in relatively short series is sufficiently large to account almost unaided for the spread of distributions such as the one illustrated in Diagram IIA. It must also be remembered that variations in the autocorrelation properties of the disturbance terms will also give rise to variations in m.d. (peaks). The joint operation of these two factors therefore does much to rehabilitate the adequacy of linear econometric models in the description of the economic process. But we have only shown that the factors are capable of producing considerable variation in m.d. (peaks) in a group of series, each member of which has the same constants in its autoregressive structure; we have not proved that all series necessarily have the *same* structure. It remains to be seen, therefore, whether the various sub-groupings of the National Bureau data suggest the existence of significant differences in this respect between various sectors of the economy, and this point is taken up in Section IV below.

(d) *Changes in economic structure.*

From the point of view of obtaining good empirical approximations to the expected value of m.d. (peaks) the longer the series the better is the approximation, but the longer the

time span covered the greater is the possibility of major changes taking place in the economic structure. Changes which affect the exogenous variables only have been implicitly considered in sub-section (b) above, since these will affect the autocorrelation properties of the disturbance term in the final equations, but not the constants of the autoregressive scheme. Changes in economic behaviour will affect these constants, since they depend upon the parameters of the economic behaviour relations, which constitute the model. If, to simplify the exposition, one assumed such changes in structure to take place discontinuously at, say, ten year intervals and if a linear set of relations adequately described the functioning of the economic process, then each variable would be governed by the *same* autoregressive scheme within a given ten year period, and a different common scheme would apply in the next period, after the postulated change in behaviour relations had taken place. In the absence of any sampling variation in m.d. (peaks) one would even then expect all variables to display the same m.d. (peaks) over the whole observation period, since they would have equal m.d. (peaks) within any given sub-period of ten years. The undoubted presence, however, of fairly substantial sampling variation in m.d. (peaks) presents a very difficult problem in statistical inference. Is the observed variation in m.d. (peaks) due solely to sampling variations and autocorrelated disturbances, the variables having the same autoregressive structure; or is the variation due to these two factors *plus* changes or differences in autoregressive structure as well? It is not possible to reach a firm conclusion, but a few points may be mentioned. If the sampling variation in m.d. (peaks) were such that the dispersion in Table IX above was markedly less than that of the empirical distributions in Tables III and IV, then it might reasonably be concluded that changes in autoregressive structure had taken place or that the series did not all have the same autoregressive structure. But in fact, as is shown in Table X, the dispersion of the sampling distribution is greater than that of the overall distribution for 794 series, and greater than the dispersion in three out of the five sub-groups. On the other hand, however, this could not be taken to rule out variations in autoregressive

structure, since, as is shown by Diagram II, substantial variations in autoregressive structure often produce little change in m.d. (peaks).

It is also rather remarkable that the extensive tests of seven selected series reported in Chapters 10, 11 and 12 of *Measuring Business Cycles* showed no significant variation in the average duration of specific cycles. Trend lines were fitted to the specific cycle durations in each series over a period of 60 and 70 years, but the correlation coefficients were not significantly different from zero. The specific cycles in each series were also arranged in three successive groups of approximately equal number of cycles and the average duration of cycle computed for each sub-group: an analysis of variance showed no significant variation in average duration among sub-groups. A similar grouping of specific cycles into pre 1914 and post 1914 again yielded no significant difference in average duration. The business cycles given by the National Bureau references dates yielded similar negative results on average duration for groupings both by three approximately equal periods and by stage of industrialisation. The authors concluded, "We can say with confidence that, on the whole, secular or structural changes have not impressed their influence very strongly on the cyclical behaviour of our sample of seven American series or on the duration of business cycles in our four countries."²⁴ Similar results appear for other tests on the average duration of specific cycles, when the cycles are grouped according to their position in the various long waves suggested by Schumpeter, Kitchin and others.

IV. DIVERGENCES IN THE CYCLICAL EXPERIENCE OF DIFFERENT SECTORS OF THE ECONOMY.*

When the National Bureau data are sub-divided according to type of activity as in Table IV, the question arises whether any significant divergences in average duration of cycles appear between the different groups. If, for example, we consider the

²⁴*Measuring Business Cycles*, p. 412.

*I am indebted to Mr. A. M. Walker for helpful discussions of the methods employed in this section.

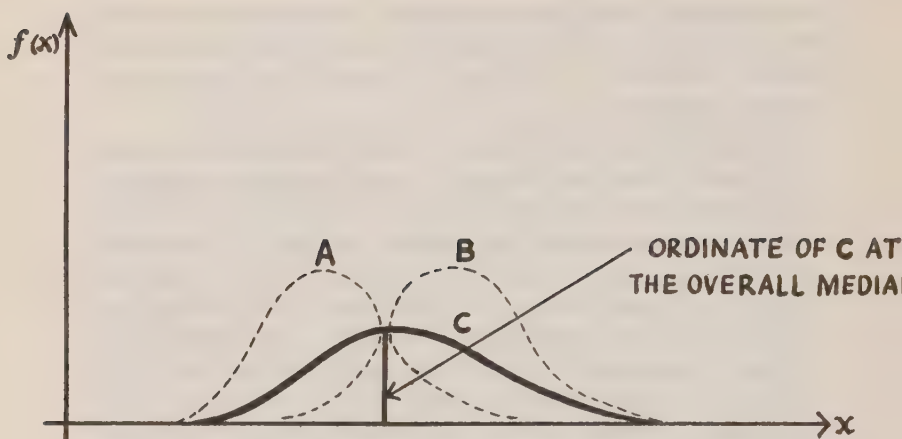
five groupings into Foods and Farm Products, Other non-Durable Goods, etc., shown in the top half of Table IV, do the medians, quartiles or interquartile ranges differ significantly between the groups?

From the data at our disposal only a rough test is possible, but we may proceed as follows. If a sample of size n is drawn from a population with distribution function denoted by $f(x)$ then for large n the sample median tends to be normally distributed about the population median m with variance $1/4n(f(m))^3$, where $f(m)$ is the ordinate of the probability distribution at the population median. As an estimate of $f(m)$ we take the ordinate of the distribution for all 794 series at the median value of 43.8 months, when the frequencies have been expressed on a relative basis. This gives est. $f(m) = 0.055$. To be on the safe side we reduced this estimate by 10%, so as to *increase* the standard error of the median and reached the result

$$(4.1) \quad \sigma \text{ (median)} = \frac{10}{\sqrt{n}}$$

There is reason for thinking that this may be an unduly high estimate of the standard error of the median of a sample drawn from these 794 series. Suppose we have two probability distributions A and B with different median values but the same dispersion and suppose that the two populations are combined to give a single probability distribution C. If the ordinate of C at the overall median is taken this will be smaller than either of the separate ordinates of distributions A and B at their respective medians and hence the ordinate of C will give an *overestimate* of the standard error of the median of samples drawn from A and B. This point is illustrated in the accompanying figure.

It will be shown below that the first five sub-groups in Table IV appear to have distributions which differ with respect to their position values but not with respect to their dispersion. In this case estimate (4.1) may well be an overestimate of the standard error of the median of samples drawn from the different groups.



The variances of the quartiles and the interquartile range are given by

$$\begin{aligned}
 \sigma^2_{Q_1} &= \frac{3}{16n (f(Q_1))^2} \\
 \sigma^2_{Q_3} &= \frac{3}{16n (f(Q_3))^2} \\
 (4.2) \quad \sigma^2_{(Q_3-Q_1)} &= \frac{1}{16n} \left\{ \frac{3}{(f(Q_1))^2} + \frac{3}{(f(Q_3))^2} - \frac{2}{f(Q_1) f(Q_3)} \right\}
 \end{aligned}$$

where $f(Q_1)$ and $f(Q_3)$ are the ordinates of the probability distribution at the population quartiles. Estimates of these two quantities were again made from the distribution for all 794 series

$$\begin{aligned}
 (4.3) \quad \text{est } f(Q_1) &= 0.0456 \\
 \text{est } f(Q_3) &= 0.0167
 \end{aligned}$$

A general test for the homogeneity of a set of medians, quartiles, etc., may then be made by using the following result. If x_1, x_2, \dots, x_k have independent normal distributions with variances $\sigma^2/w_1, \sigma^2/w_2, \dots, \sigma^2/w_k$ a test of the homogeneity of

the x 's may be made by computing $x = \frac{\sum_{i=1}^k w_i x_i}{\sum_{i=1}^k w_i}$ and then

referring $\sum_{i=1}^k w_i(x_i - \bar{x})^2/\sigma^2$ to the χ^2 distribution, with $k-1$ degrees of freedom.²⁵ The weights w_i , in this example are the numbers of series in the various groups. Table XI presents the results of applying this test to all the quartiles and the interquartile range for the first five sub-groups in Table IV.

TABLE XI

TEST FOR HOMOGENEITY OF QUARTILES AND INTERQUARTILE RANGE IN THE FIVE SUB-GROUPS, FOODS AND FARM PRODUCTS, OTHER NON-DURABLE GOODS, DURABLE GOODS, INVENTORIES, FINANCE

Statistic	χ^2	Remarks
Median	50	significant at 1% level.
Lower quartile (Q_1)	60	significant at 1% level.
Upper quartile (Q_3)	11	significant at 5% but not at 1% level.
Interquartile range ($Q_3 - Q_1$)	5.7	not significant.

$\chi^2 = 9.5$ at 5% level and 13.3 at 1% level for 4 degrees of freedom.

This test shows significant differences between the position values for the five sub-groups but not between the dispersions. Each of the first three sub-groups consists of series relating to production, prices, trade, employment, payrolls, etc.

It is of interest to follow up the analysis in Table XI with an examination of differences between each quartile measure for various pairs of groups, to see which groups contribute most to the overall heterogeneity. The results are given in Table XII.

These figures support the conclusions in Table XI and enable us to make a tentative ordering of the various groups in declining length of average duration. At the top of the list comes Foods and Farm Products with the longest average duration; when it is compared with Other non-Durables, Inventories and Finance it is seen that in each case the differences for all three quartiles are highly significant; in the comparison with Durables only one difference is significant, but the other two differences are also positive and are fairly close to the 5%

²⁵See Irwin J. D. *Journal of the Royal Statistical Society*, 1942, pp. 115-8.

It is impossible to say to what extent our sample statistics, such as the group medians, fulfil the assumption of independence required for this test, and this is why we have arbitrarily increased σ (median). In spite of this the value of χ^2 for the median (as also for the first quartile) is very large.

TABLE XII
DIFFERENCES BETWEEN QUANTILES FOR PAIRS OF SUB-GROUPS
EXPRESSED IN TERMS OF STANDARD ERRORS

Medians				
	Other non-Durables	Durables	Inventories	Finance
Foods and Farm ...	6**	4**	5.4**	4.9**
Other non-Durables..		-2.7**	0.8	-1.3
Durables ...			2.7**	1.3
Inventories ...				-1.7
First Quartiles				
	Other non-Durables	Durables	Inventories	Finance
Foods and Farm ...	6**	1.6	5.6**	3.7**
Other non-Durables..		-5**	1.2	-2.3*
Durables ...			4.8**	2.5*
Inventories ...				-2.9**
Third Quartiles				
	Other non-Durables	Durables	Inventories	Finance
Foods and Farm ...	2*	1.5	2.2*	3.0**
Other non-Durables..		-0.7	0.7	1.2
Durables ...			1.2	1.9
Inventories ...				0.2

* significant at 5% level.

** significant at 1% level.

level of significance. In the same way the Durables group appears to have a significantly longer average duration than the three remaining groups of Other non-Durables, Inventories, and Finance: in the comparisons with Other non-Durables and Inventories, two of the three differences are significant in each case and in the comparison with finance only one difference is significant but the other two (1.3 and 1.9) are also positive and one is very close to the 5% level of significance. In comparing Other non-Durables with Inventories and Finance only one difference is significant out of a possible six, and in the comparison of Inventories with Finance only one out of three. A provisional ordering of the groups in decreasing average duration would then be

Foods and Farm Products.

Durables.

Other non-Durables. Inventories. Finance.

In conclusion a few comments are suggested on the two topics of sector and non-linear models. It would appear that a fruitful line of development in future econometric work is the construction of sector models which would adequately picture the varying characteristics of specific sectors of the economy and avoid the necessity of compressing these into the framework of a single aggregative model. Professor Tinbergen has suggested the use of a master model to link up the various sector models.²⁶ It would be necessary to ensure here that the use of, say, a linear master model did not impose just as severe a restriction on the variety of behaviour to be described as does the single aggregative model.

While linear econometric models have often given a good fit especially to inter-war data when economies were operating at well below capacity levels, and while Sections III(b) and III(c) above have removed most of the doubt initially cast on the applicability of linear models by the empirical data on cycle length, it would seem that more intensive examination is called for both of the theoretical aspects and empirical applications of non-linear models. This will be the more true when attention is concentrated on the post 1945 data, which reflect the operation of economies at levels close to the restraints imposed by full employment, raw material shortages, etc.—a situation in which non-linear models are inherently more realistic.

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²⁶N.B.E.R., *Conference on Business Cycles*, p. 140.

National Insurance Contributions, 1946-1955

The main object of this article is to examine the extent to which the financial provisions of the 1951, 1952 and 1954¹ National Insurance Acts departed from the method of financing National Insurance benefits set out in the 1946 Act. To simplify and shorten the discussion attention will be concentrated upon employed males and little space will be devoted to non-employed and self-employed persons or to employed females.

BENEFITS.

Table I shows the changes in the main rates of benefit from the start of National Insurance to the present time.²

TABLE I
SOME NATIONAL INSURANCE BENEFITS FOR EMPLOYED
MEN AND THEIR DEPENDENTS

	1946 Act	1951 Act	1952 Act	1954 Act
Unemployment and Sickness Benefit—				
Single Man	26/-	26/-	32/6	40/-
Married Couple	42/-	42/-	54/-	65/-
do. do. and one child ...	49/6	52/-	64/6	76/-
Retirement Benefit—				
Single Man or his Widow ...	26/-	26/- or 30/-*	32/6	40/-
Married Couple	42/-	42/- or 50/-*	54/-	65/-

* The standard rate of retirement pension was increased by 4/- to 30/- in the case of a single person and by 8/- to 50/- in the case of a married couple for men over 70. Those under this age also received these increases if on 1/10/51 they had attained 65. Men retiring after 1/10/51 under age 70 would only receive the old rates of 26/- or 42/- if married.

The level of benefits is linked in a rough and indirect way with the amount of money required to provide a subsistence standard of living. The government in arriving at the rates of benefit which were set out in the 1946 Act accepted the principles

¹The 1953 National Insurance Act only affected Maternity Benefits and did not alter the rates of or the principles determining contributions.

²I have not given the rates of Death Grant, Maternity Benefit, or Widows' Allowance.

which Beveridge had adopted in his famous Report on Social Insurance.¹ He argued there that "the rates of benefit provided by Social Insurance should be such as to secure for all *normal* cases an income adequate for subsistence."² The word 'normal' is important as the rates of benefit produced by Beveridge's calculations did not mean that a subsistence income would be provided for everyone.

There were two main reasons that made it difficult or impossible to provide a subsistence income for all under a compulsory and general system of National Insurance. The first was the fact that as rents varied widely not only from one part of the country to another but also within a particular area a single rate of benefit which would provide everyone with a subsistence income would mean that a large number of people would receive payments substantially above that level.³ The second reason was that it was not considered practicable to have rates of benefit varying automatically with the price level and it was realised that in periods of fluctuating prices rates of benefit might get out of line with average subsistence requirements.

'The principle the government accepted, therefore, was that benefits should be such as to provide a subsistence income to the average claimant. National Assistance was to look after people who were not average. An attempt was made, however, to prevent benefits getting substantially out of line with average subsistence income for under Section 40 of the 1946 Act the Minister has every five years "to review the rates of benefit in relation to the circumstances of the insured population including the expenditure necessary for the preservation of health and working capacity." This was an entirely new provision; no such clause is to be found in the earlier legislation.

Beveridge calculated his average subsistence benefit rates in terms of 1938 prices. The government in the 1946 National

¹*Report on Social Insurance and Allied Services*, Cmd. 6404, 1942.

²*Op. cit.*, para. 193.

³In arriving at his 'normal' figure for the 1938 income necessary for subsistence Beveridge incorporated a rent allowance for households of 10/- a week. This was somewhat below the 10/9d. a week which was the average weekly rent paid by all industrial households included in the Ministry of Labour Family Budget enquiry in 1937-38.

Insurance Act arrived at its benefit proposals by taking the Beveridge figures and increasing them by 31% ; this representing the increase in the cost of living 1938-46 recorded by the Ministry of Labour Cost of Living Index Number ; and the resulting figures were the rates of benefit that came into operation in July, 1948, even though prices increased during the period 1946-48.¹

These general rates of benefit remained unchanged till 1952 when they were increased, the Minister of National Insurance then arguing that the increase restored the benefits to the purchasing power they had had when the scheme came into operation in 1948.² In 1954 there occurred the general review of benefits and contributions required under the 1946 Act and out of this review there emerged the 1954 National Insurance Act due to come into operation in the early summer of 1955. The Minister in his speech commending the Bill³ began by indicating the increase needed to restore the purchasing power of the benefits to the 1952 level. He then said that he would take a broader view as this was the Quinquennial Review and that benefits should be restored at least to their 1946 values. Having suggested that the increase in the price level 1946-54 indicated an increase of about 5/- a week for single persons and 6/6d. a week for married couples he stated that he thought there should be some margin over the 1946 level and proposed increases of 7/6d. for single persons and 11/- for married persons thus making the main weekly benefit rates 40/- for a single person and 65/- for a married couple.

In an article dealing with the finance of National Insurance it has been necessary to discuss the rates of benefit in order to show the link between them and the price level and the more or less objective factors that determine a subsistence level of real income. What has to be understood is that benefits are fixed to a considerable extent independently of contributions and, in practice, it is likely that rates of benefit are decided upon before the size of contributions is considered.

¹The London and Cambridge Economic Service Index of Retail Prices (1938 = 100) was 150 in 1946 and 173 in 1948.

²*H. C. Debates*, Vol. 500, Col. 37.

³*H. C. Debates*, Vol. 535, Cols. 961-982.

FINANCE AND THE 1946 ACT.

It was estimated that the various benefits of the 1946 Act would require an expenditure of about £450m. in the first full year of operation rising to about £500m. at the end of five years and over £800m. by 1978.¹ Perhaps the best way of getting to grips with the complexities of National Insurance finance is to see how it was planned to meet this expenditure and—in particular—the procedure that was used to arrive at the weekly rates of contribution to be paid by employers and employees. The second problem will be taken first.

The underlying principle was essentially the same as that used in determining the rates of contribution under the 1911 Unemployment Insurance Act and the 1925 Contributory Pensions Act, namely that it should be linked in a prescribed actuarial manner to the level of benefits. What is important and interesting is the specific actuarial formula that was adopted.

We may define the Actuarial Contribution of the 1946 Act in the following way. It was supposed to be that weekly sum of money which would be needed on average to provide a person who contributed from the age of 16 with the benefits of the scheme on the assumption that contributions not spent on current benefits for the contributor were invested to meet his future needs, and on the assumption that rates of benefit remained unchanged.

In order to arrive at this Actuarial Contribution a number of special assumptions as well as the normal actuarial ones about mortality, sickness, fertility and marriage rates have to be made. Some of these are very complicated and technical and are not quantitatively very important but there are two very important general economic assumptions that are required.²

¹*Report by the Government Actuary on the Financial Provisions of the Bill*, Cmd. 6730, 1946, para. 43. The rapid increase is due to two main factors. First the increasing proportion of older people in the population and second the fact that a higher proportion of the population over retirement age will become eligible for retirement pension.

²For a full discussion of the problems involved in calculating the Actuarial Contribution see : The Appendix to *Report of the Government Actuary on the 1946 Bill*, Cmd. 6730, and *Report by the Government Actuary on the First Quinquennial Review*, H. C. Paper, No. 1, 1954-5, Appendices 4 and 5.

Before such a calculation can be performed an actuary has to take a view about the future level of unemployment as this has a substantial effect on both income and expenditure and, secondly, he has to assume a particular rate of interest. In the calculations that produced the 1946 level of contributions the Government Actuary was instructed by the government to assume that $8\frac{1}{2}\%$ of the employed population would, on average, be out of work and, after consultation with the Treasury, he assumed a long term rate of interest of $2\frac{3}{4}\%$.

On the basis of these special assumptions actuarial calculations were made for men and women in each of the three classes of the scheme; employed persons, the self-employed and the non-employed. The results that made up the male employed person's contribution are set out below:¹

TABLE II
BUILD UP OF ACTUARIAL CONTRIBUTION FOR EMPLOYED
MALES (1946 RATES OF BENEFIT, Etc.)

	<i>Pence per week</i>
Retirement	46·9
Widows' benefits and Guardian's Allowance ...	9·5
Unemployment	32·0
Sickness	19·5
Maternity benefits	1·0
Death Grant	1·9
Administration	5·0
	115·8

Source: *Government Actuary's Report on the Financial Provisions of the 1946 Bill*, Cmd. 6730.

The full Actuarial Contribution worked out at 115·8d. or about $9\frac{7}{8}$ d. Of this total roughly two-fifths (46·9d.) was to be paid by the insured person, about two-fifths (44·1d.) by his employer, and about one-fifth (24·8d.) by the Exchequer.²

¹Similar detailed calculations were made for each of the other classes in the scheme.

²The actual proportions were arrived at in the following way. As under the old Unemployment Insurance scheme the exchequer was to contribute one-third of the actuarial premiums required for this benefit and, following the practice of the National Health Insurance Scheme the State was to contribute one-sixth of the actuarial payments required for all the other benefits except the Death Grant. The remaining two-thirds of the unemployment premiums and five-sixths of the other premiums were split equally between the employer and the insured person except that in the case of Maternity Benefits and Death Grant the employer made no contribution.

Two other points have to be brought out in connection with the weekly rates of contributions proposed in the 1946 Act.

It was thought that individuals should make some direct contribution to the cost of the National Health Service even though most of this expenditure was to come from general taxation¹ and it was decided that an employed person should pay 8·5d. a week and his employer 1·5d. to this end and that these payments should be collected as part of the weekly National Insurance contribution.

The 1946 Act also proposed that as from October, 1951, an additional 4d. contribution (split equally between employer and employee) should be paid in order to assist the Exchequer in meeting the "deficits" which were expected to arise on the National Insurance Fund.

It is important to notice that this extra 4d. had nothing to do with any actuarial calculation, and that though the determination of the total contribution was linked *via* an actuarial calculation to the value of the benefits the precise split up of the contribution as between employer, employee and the Exchequer had no such link.

We may summarise how the weekly contribution was made up under the 1946 Act as follows :—

TABLE III
WEEKLY RATES OF CONTRIBUTION (EMPLOYED MALES) UNDER 1946
NATIONAL INSURANCE ACT

	Employee Pence	Employer Pence	Exchequer Pence	Total Pence
Actuarial Contribution	46·9	44·1	24·8	115·8
Contribution to National Health Service ...	8·5	1·5		10·0
Total	55·4	45·6	24·8	125·8
Weekly Stamp	55·0	46·0	25·0	126·0
Weekly Stamp after October, 1951 ...	57·0	48·0	25·0	130·0

¹At present over nine-tenths of National Health Service expenditure comes from general taxation.

Income from the Actuarial Contributions of employees, employers and the Exchequer Supplement was expected to be about £400m. in the first full year rising to about £420m. in 1954-5 (including the non-actuarial 4d.) and thereafter to remain fairly constant. Income from Investments was expected to be about £21m. throughout the period.¹

Bringing together the income and expenditure sides of the account it was estimated that a deficit of about £35m. was to be expected in the first full year rising to about £60m. in 1954-5. It was then expected that the deficit would increase quite rapidly reaching about £100m. a year in 1958 and about £300m. in 1978. The reason for these deficits was that though persons over the age of 16 were given the full benefits of the scheme (or nearly the full benefits) they were not asked to pay a higher rate of contribution or to make back payments; the government of the day accepting responsibility for the resulting gap between income and expenditure. The Philips Committee has estimated that the capital liability assumed by the State for retirement pensions in July, 1948, was of the order of £8,500m. (after allowing for future contributions) of which about £6,000m. was in respect of persons under retirement age at the time; or about £280 on average for each of the 21 million contributors.² The actuarial contribution required to provide the benefits for a man entering the scheme at age 25 would have been about one-third greater than that required at age 16 whilst at ages 35, 45, and 55 the appropriate actuarial contribution would have been about twice, three times and seven times the age 16 contribution. The expected deficits which were the difference

¹The National Insurance Fund was to take over the assets of the existing Unemployment, Pensions and Sickness schemes which amounted to about £900m., some £550m. of this coming from the Unemployment Insurance Fund—the result of low war-time and post-war unemployment—about £230m. from the Sickness funds and the remainder from the Contributory Pensions Scheme.

²See *Report of the Committee on the Economic and Financial Problems of the Provisions for Old Age*, Cmd. 9333, December, 1954, para. 157 for an excellent treatment of this problem.

It has also to be realised that each time benefit rates are increased and contributions are increased in accordance with the actuarial formula the emerging deficit is increased. In 1952 for instance the effect of the increased benefits and contributions was to increase the expected deficit for 1957-58 by £14m., for 1967-68 by £27m. and for 1977-78 by £36m.

between the total expenditure and the sum of contributions and interest income represented the claims additional to the Exchequer Supplement (*i.e.* the Exchequer share of the Actuarial Contribution) expected to fall upon the Exchequer. In Section 2 (3)b of the 1946 National Insurance Act funds were provided to meet these payments: £3m. a month was provided for the first months of the scheme, £40m. for the year 1949-50 thereafter rising by £4m. a year till 1954-5. After that Parliament was to determine the level of grant in the light of the circumstances then existing. These payments were estimated to be sufficient but no more than sufficient to maintain the National Insurance Fund at a constant level.¹

THE 1951 AND 1952 ACTS.

Soon after the scheme came into operation in July, 1948, it became obvious that the actuarial assumptions that had produced the financial structure noticed above had been too pessimistic. The level of unemployment was around 2% instead of 8½%, the rate of interest was above 2¾% and sickness claims were below what had been expected. The effect of these happenings was that instead of the Insurance Fund being in balance a surplus resulted each accounting period. In the first period (July, 1948—March, 1949) there was a surplus of £85m.; in 1949-50 one of £131m.; and in 1950-51 one of £144m. No change was made, however, either in the size of the weekly contributions or in the size of the annual Exchequer Grant till the decision was taken in the spring of 1951 to increase certain benefits.

The happenings of 1951 are important and we shall have to go into them in some detail. We have to distinguish very carefully between: (1) what was going to happen in 1951 under the 1946 Act; (2) the government's proposals as set out in the National Insurance Bill of 1951; (3) what finally emerged out of the parliamentary process as the 1951 National Insurance Act.

Under the 1946 Act rates of contribution were to go up by 4d. for each insured person in October, 1951, in order to reduce the financial burden falling upon the Exchequer due to

¹At the £900m. level mentioned in footnote 1, page 234.

late age entrants, etc. As the Fund was running a surplus of over £100m. a year it might have been expected that the government would have postponed the introduction of this additional levy.

There were two main proposals relating to finance in the 1951 Bill. The first was the proposal to make the Exchequer Supplement of all insured persons 6d.; thus reducing, for example, that paid on behalf of employed males by 1/7d. and making it about one-sixteenth of the total contribution instead of one-fifth.¹ The second proposal was to reduce the Exchequer Grants for the period April, 1951 to March, 1955, from £48m. a year for 1951-2 rising by £4m. a year to £60m. in 1954-55 to £24m. for the first year of the period, £10m. for the second, £30m. for the third and £60m. for 1954-55.

The first proposal was connected with the new advice that the Government Actuary received from the government. He was instructed to assume a long-term average unemployment percentage of 4% (instead of $8\frac{1}{2}\%$),² and advised by the Treasury to assume a rate of interest of 3% (instead of $2\frac{3}{4}\%$). With these alterations in basis, and on the assumption that the then current mortality rates continued, the Government Actuary found that *taking all classes together* the proposed new levels of contribution would be adequate on the age 16 actuarial basis to provide the benefits of the 1946 Act as modified by the proposals in the 1951 Bill.³

The phrase in italics is important. The main reason for the surplus had been the much lower level of unemployment; something like £100m. a year of it was due to this single factor. Now only employed persons are eligible for unemployment pay and have part of their contribution linked to this particular risk. The combined effect of the proposed reduction in the Exchequer Supplement and the increase in benefits which

¹The Exchequer Supplement under the 1946 Act was 2/1d. for men and 1/7d. for women employees; 1/- for the self-employed male and 9d. for the self-employed female; 9d. and 7d. respectively for the non-employed male and female.

² $1\frac{1}{2}\%$ to March, 1954, rising to $2\frac{1}{2}\%$ over the year 1954-55 and thereafter to 4%.

³*Report by the Government Actuary on the Financial Provisions of the 1951 Bill*, Cmd. 8212, para. 14.

applied to all classes in the scheme meant that the contributions of employed persons were greater than required on the age 16 actuarial basis and that those of self-employed and non-employed persons were less than required.

The reductions in the Exchequer Grant were planned so as to keep the Insurance Fund constant. The amounts set out in the Bill constituted the estimated deficits of the Fund for the years in question taking into the account the proceeds arising from the additional 4d. contribution which was to come into operation as planned under the 1946 Act.¹

Three points should be noticed with respect to the financial proposals of the 1951 Bill. First they preserved the principle of fixing the contributions to the scheme in relation to the age 16 actuarial cost of the benefits ; 'better' assumptions enabled the average Actuarial Contribution to be lower even though benefits were increased. Secondly it altered substantially the relative burden on the various classes of contributor, increasing above the actuarial level the burden upon the employed and reducing the burden upon the other classes. This represented a departure from the 1946 position but this was probably due to the difficulty if not impossibility of making elaborate and exact actuarial calculations so soon after the scheme had begun operations and before the results of the 1951 census could be analysed. The third point is that the government proposed a quite arbitrary cut in the Exchequer Supplement ; presumably the main arguments here were those of simplicity and expediency.²

Important changes relating to the expenditure and income proposals of the Bill were made during its passage through the House of Commons. The government had proposed that the new higher rate of retirement pension should only be paid to

¹In his *Quinquennial Review* the Government Actuary has suggested that this additional contribution if added to the 'ordinary' contribution produced a rate of contribution which was just about what was actuarially necessary if it was assumed not that mortality rates, etc. would remain as they were in 1950-51 but would improve in the way expected.

²From an overall public finance point of view this was a much simpler thing to do than reducing the contributions of employers and employees. If this alternative policy had been adopted the government would have had to take measures to increase taxation by the amount of the reduced National Insurance payments.

men over the age of 70 and women over the age of 65 and that pensioners under these ages should continue to draw the existing (1946) rates. After much pressure the government finally agreed that the new higher rates of benefit should apply to males who were 65 (women 60) in October, 1951, but that new old age pensioners, *i.e.* people reaching the age of 65 (women 60) after October, 1951, would continue to receive the 1946 rate of benefit till they reached the age of 70 and 65 respectively. It was estimated that this concession would cost about £7m. in the first full year, gradually tapering off.

Much more important from our point of view were the changes on the income side. The Minister came under strong attack from both sides of the House with regard to her proposed reduction in the Exchequer Supplement. What finally emerged from the House of Commons was as follows. The Exchequer Grants were discontinued for the rest of the five year period to March, 1955, and the Exchequer Supplement was increased from about one-sixteenth of the combined contribution for an employed man to about one-seventh (as compared with the earlier one-fifth) and there were similar increases for other classes of contributor.¹

These additions to the Supplement (as compared with what had been proposed in the Bill) were equivalent—on average—to an extra 8d. a week for *all* insured persons² and their effect was to make the *average rate* of contribution higher than the age 16 Actuarial Contribution and, therefore, to make the employed person's contribution substantially above his or her Actuarial Contribution.

The additional 4d. contribution proposed in the 1946 Act was also to come into operation even though the fund was expected to have a surplus up to and including the financial year 1954-5.

What is important about the happenings of 1951 is the tremendous changes that were made and proposed concerning a scheme the basis of which—it is often claimed—is that a

¹The Bill's proposal of a 6d. contribution for all classes became in the Act 1/4d. for employed men and 1/- for employed women; 8d. and 6d. respectively for both non-employed and self-employed men and women.

²*Quinquennial Review*, para. 35.

contractual relationship exists between the parties to it and that there is an agreed and accepted set of rules or principles relating contributions to benefits. In 1951 these rules were certainly flouted; the original government proposals offended against them and the revised version that became law, though it modified certain of the original heresies, also introduced some new ones.

There were no important changes of principle in the 1952 Act. All benefits were increased and contributions were increased very roughly according to the age 16 actuarial formula using the same assumptions as were used in 1951.¹

Owing to the fact that the Government Actuary had under the 1946 Act to "make a report to the Treasury on the financial condition of the National Insurance Fund and the adequacy or otherwise of the contributions payable under the Act to support the benefits payable thereunder"² in 1954 it is possible to document very exactly the relationship between the 1952 level of benefits and the weekly contributions payable by the various classes of contributor.

Assuming a rate of unemployment of 4% and a rate of interest of 3% and using the latest available information about future mortality, fertility and marriage rates and about all the other complex variables that enter into such a calculation, the Government Actuary found that the age 16 weekly Actuarial Contribution for an employed male was 113·2d. and for self-employed and non-employed males 89·7d. and 63·8d. respectively.³ The actual contribution being paid (including the 4d. of the 1946 Act) was 128d. by and on behalf of employed males and 88·5d. and 66·0d. for the other male classes.

Even if one deducts the extra 4d. (as perhaps one should as it was supposed to be additional to the Actuarial Contribution) it is obvious that the actual payments being made by employed persons were substantially in excess of the Actuarial

¹Except that for the short-term unemployment assumption the Government Actuary assumed a rate of 2% to 1953-4 and 3% to 1954-5. The changes in benefits and contributions were considered independently of the existing level of benefits and contributions. See *Government Actuary's Report on the 1952 Bill*, Cmd. 8518, para. 10.

²Section 39 (1) (a) of the 1946 Act. The Quinquennial Review of the Government Actuary was to precede the Minister's Quinquennial Review.

³The corresponding figures for females were 94·2d., 78·6d. and 51·8d.

Contribution and that the contributions of self-employed and non-employed were below the age 16 actuarial level.¹

THE 1954 ACT.

As we saw earlier in the paper, rates of benefit were substantially increased in the 1954 Act. The Bill followed the Minister's Quinquennial Review of the operation of the scheme as a whole and the proposed methods of financing the expenditure departed in some important aspects from the 1946 principles.

The main fact that needs emphasising is that the new weekly rates of contribution to the National Insurance Fund are in excess of the sums produced by an age 16 type of actuarial calculation.² Roughly speaking the planned excess is—for an employed male—about 1/6d. a week.³ A new development, however, is that this 1/6d. is divided up between the three parties to the scheme in the same proportion as the Actuarial Contribution itself; thus the employee and employer each pay 8d. and the Exchequer 2d.

TABLE IV
WEEKLY PAYMENTS ON BEHALF OF AN INSURED MALE
EMPLOYEE, 1954 ACT

					Insured Person		Employer	
					s.	d.	s.	d.
Total weekly payments	...	...	...	...	6	9	6	0
To Industrial Injuries Fund	...	...	...	...	5		6	
To National Health Service	...	...	...	...	8½		1½	
Payments for National Insurance Benefits	...	...	...	...	5	7½	5	4½
Exchequer Supplements	...	...	...	...	11		11	
					6	6½	6	3½

Total Payments into National Insurance Fund on
behalf of an insured male employee ... 12/10d.

¹The excess contributions of male and female employees was 10·8d. and 2·3d. a week and the weekly contributions of self-employed males and females and non-employed males and females were less than the appropriate Actuarial Contribution by the following amounts: 5·2d., 9·1d., 1·8d. and 3·8d. See Table VII of the *Quinquennial Review*.

²Based—with one exception—on the same actuarial information and assumptions as used by the Government Actuary in his *Quinquennial Review*. The exception related to the Unemployment assumption. The assumed level of unemployment was taken to be 1½% in 1956-57 instead of the 2% adopted in that *Review*. For later years the assumptions were the same *i.e.* 3% for 1957-58 and 4% thereafter.

³To be precise the planned excess over the Actuarial Contribution is as follows: 17·8d. for an employed male, 13·0d. for a self-employed male, 12·7d. for a non-employed male; the corresponding figures for females being 15·9d., 10·3d. and 9·9d.

Table IV sets out the details of the weekly contributions to be made on behalf of an employed male under the 1954 Act and Table V compares this weekly contribution of 12/10d., and its component parts, with the Actuarial Contribution as calculated by the Government Actuary.

TABLE V

COMPARISON OF THE ACTUARIAL CONTRIBUTION FOR AN
EMPLOYED MALE WITH THE LEVEL OF CONTRIBUTION
IMPOSED IN THE 1954 ACT

All items in pence				
Weekly Actuarial Contribution necessary to produce the benefits set out in the Act ¹	...	...	...	136.2
Divided up as follows : ²				
Insured Person	...	...	59.5	
Employer	...	...	57.2	
Exchequer	...	...	19.5	
Weekly Contribution laid down in the Act	...	...	...	154.0
Divided up as follows :				
Insured Person	...	...	67.5	
Employer	...	...	64.5	
Exchequer	...	...	22.0	
Excess of weekly payments over the actuarially necessary payments				17.8
Divided up as follows :				
Insured Person	...	...	8.0	
Employer	...	...	7.3	
Exchequer	...	...	2.5	

Source : *Government Actuary's Report on 1954 Bill.*

In proposing that contributions should be greater than the Actuarial Contribution the government was acting in accordance with the recommendations of the Philips Committee.³ This committee suggested that if and when benefits were increased in the future—and it was, of course, reporting before the Minister published the proposals that appeared in the 1954 Bill—the increase in contributions should be such as to limit the increase in the deficits on the National Insurance Fund to that arising with respect to those persons already in receipt of retirement pensions. The committee recommended that when benefits were increased “the addition to the level of contribution should not be confined to the increase appropriate to an age 16

¹Built up in the same detailed manner depicted in Table II.

²The Actuarial Contribution is divided up in the same proportion as the actual contribution laid down in the Act.

³It is probable that the Minister had come to his conclusion on this issue before seeing the Philips Committee Report.

contribution. There should in our view be added such further sums as will be sufficient on average for the whole body of contributors at the time to meet the part of the increase in benefit rates not covered by the increase in the age 16 contribution, one-seventh of this contribution to be paid by the Exchequer."¹

The addition to the Actuarial Contribution that the government proposed in the 1954 Bill was not as great as that required under the Philips Committee formula; indeed the extra 1/6d. was only about half the necessary sum for an employed male.²

Even with the additional non-actuarial contributions a substantial deficit is expected in the future. In 1955-56 a deficit of £1m. is expected rising to £145m. in 1959-60, £295m. ten years later, and £424m. in 1979-80. The expected cumulative total of annual deficits for the next five years is £326m. and Clause 2 (3) of the Act provides that for a period of five years beginning 1st April, 1955, sums not exceeding a total of £325m. may be paid by the Treasury to the National Insurance Fund (in addition, of course, to the Exchequer's share of the Actuarial Contribution) in order to meet the deficits, and after that period such sums as Parliament may determine.³

Table VI shows for four different years the expected relative importance of the Insurance Fund's various sources of Income. It is easy to see how Exchequer grants grow in importance and the corresponding reduction in the importance of contributions. It is interesting to note that contributions by the insured persons themselves will only provide about 40% of total expenditure in 1955-6 and no more than about

¹*Op. cit.*, paras. 171-173. Two members of the Committee were not prepared to support this proposal unless the Exchequer Supplement was increased to the pre-1951 proportion. Professor Alec Caincross (pp. 86-87) thought it necessary to distinguish between increases in benefit rates that maintained the real value of benefits and those that increased them. He agreed with the majority of the Committee when the change represented an increase in the real value of benefits but thought that when the change was merely a reflection of a change in the value of money that the Exchequer should bear the burden. Another member of the Committee disagreed with the proposal.

²*H. C. Debates*, Vol. 535, Col. 977.

³The deficits are, of course, due to the factors that we mentioned when discussing the expected deficits under the 1946 Act.

TABLE VI
THE FINANCE OF NATIONAL INSURANCE 1955-1980

Year	Expenditure		Income			£m.
	Total	Retirement Pensions as % of Total Expenditure	Contributions of Insured Persons and Employers	Exchequer Supplements	Interest	
1955-56	652 (100%)	67%	516 (78%)	90 (14%)	45 (7%)	1
1959-60	800 (100%)	64%	519 (65%)	91 (11%)	45 (6%)	145 (18%)
1969-70	970 (100%)	69%	536 (55%)	94 (10%)	45 (5%)	295 (30%)
1979-80	1093 (100%)	73%	531 (49%)	93 (8%)	45 (4%)	424 (39%)

Source: As in Table V.

25% in 1979-80. Without the additional non-actuarial payments these percentages would be appreciably smaller.

The following points summarise what is important in the contribution clauses of the 1954 Act : (i) the lack of balance as between the different classes of insured person was evened out ; (ii) a rate of contribution substantially in excess of the age 16 Actuarial Contribution was proposed for all classes ; (iii) the Exchequer contracted to pay a share of the non-actuarial part of the contribution ; (iv) the 1951 split up of the Actuarial Contribution between the three parties to the scheme was maintained ; there was no return to the 1946-51 division.

CONCLUSION.

During the period 1946-55 there have been a number of changes in the way payments into the Fund by the contributors are related to the benefits available under the National Insurance scheme. These changes, statistics such as those presented in Table VI, and a number of other facts and arguments,¹ have persuaded a number of people that it is

¹Eg. that the contributory system imposes an unfair burden upon the lower income groups and that it is an expensive way of raising money.

desirable to finance National Insurance benefits out of general taxation.¹ To argue the case for or against the contributory principle would go far beyond the scope of this paper. What is relevant, however, is to suggest that if contributions are maintained there should be some close and direct link between them and the benefits.² This means not only that governments would undertake to use a particular actuarial formula for calculating rates of contribution but also that they would agree neither to alter the way in which the Actuarial Contribution is divided up between the parties to the scheme nor to impose arbitrary additions to the Actuarial Contribution. Unless there is some such definite relationship between benefits and contributions it is difficult to distinguish contributions from tax payments and to defend the contributory method of finance.³

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¹See, for example, R. M. Titmuss, "Pension Systems and Population Change," *Political Quarterly*, April-June, 1955, and the speeches about the 1954 National Insurance Bill by Messrs. Bevan, Hughes and Silverman (*H.C. Debates*, Vol. 535, Cols. 1159, 1446 and 1458).

²See *Philips Committee Report*, para. 167.

³The age 16 actuarial formula need not be regarded as essential. What is important—assuming it is desired to keep the contributory principle—is to establish a formula that most people agree about and are prepared to operate and then to stick to it: any resulting deficit to be made up by the Exchequer.

Owner-Farming in England and Wales, 1900 to 1950

This article discusses the re-emergence in the present century of owner-occupation¹ as a significant tenurial form in the agriculture of England and Wales. In 1900, 13·5 per cent. of the cultivated area was farmed by its owners; by 1950 the percentage had risen to 37·5 per cent. We start with a brief discussion of the events which led up to this change, the first of which occurred in 1867. The early discussion concerns the period between 1867 and 1908, the last year in the present century of decreasing owner-farming. The years from 1909 to 1927 are dealt with in considerable detail, these being the years in which the bulk of the increase occurred. The years after 1927 are treated as briefly as those before 1909, and the article concludes with a brief examination of the present position.

I. THE PRELIMINARY YEARS: 1867 TO 1908.

This period opens with the Reform Act of 1867 and covers the agricultural depression of the late 1870's, the slow process of adjustment of English farming to changing conditions, and the re-emergence of prosperity in the new century.

The Reform Act, by further extending the franchise, weakened the incentive for politically minded men to hold, or build up, agricultural estates in order to secure the votes of their tenants. Between 1832 and 1867 very little land passed into owner-occupation, despite the general prosperity of farming, as the ownership of a number of £50 leaseholds, together with the growing device of yearly tenancies, enabled land-owners to secure for themselves the votes of their tenants who knew that failure to use "correctly" the votes given them in 1832 would lead to the termination of their tenancies.² After 1867 the relative importance of these votes diminished.

¹The terms "owner-farmer" and "owner-occupier" are used interchangeably to describe those farmers who own the land which they work. The term "farmer-in-hand" will be used to describe land-owners, classed as owner-occupiers, who are temporarily farming land as an alternative to letting it.

²cf. G. Broderick, "English Land and English Landlords," *Cobden Club*, 1881, p. 205).

This, coupled with agricultural prosperity, led to land being sold for owner-occupation in the early 1870's.¹ These sales, and the concurrent increase in owner-occupation, ceased in the depression of 1874, depression intensified by the entry of American farm produce to British markets and by adverse weather conditions between 1875 and 1879. Failure among farmers was widespread, rents often could not be paid and mortgage payments usually not maintained. Many owner-farmers lost their farms or became the tenants of the mortgagees: landlords, unable to let land, often farmed it in hand.

In the early 1880's, owner-occupation was fairly widespread, brought about not by the ownership of their farms by farmers, but by the farming of their land by owners who were unable to let the farms to suitable tenants. Rents fell continuously as agriculture adjusted itself to the new competitive conditions; in 1877 gross rents in England and Wales were £48.6 million while by 1899 they had fallen to £33.9 million.² The index of gross rent per acre (28/- per acre = 100) fell from 107 to 71 in the same period.³ In the circumstances, the inducements to land-owners to sell land were greatly increased, but land was difficult to sell. In 1890 however, the reports preceding the Agricultural Returns speak of purchases of small farms for owner occupation in Wales. Such purchases began about 10 years later in England. Alongside of these purchases went the letting of farms in hand which became possible as rents were adjusted to the new circumstances and as agricultural conditions improved.

During the early years of the present century the letting of farms in hand continued, reducing continuously the extent of owner-occupation. This process was more or less completed by 1908, save for some large farms. At the same time, the number of working owner-farmers was increasing. As farms became in greater demand to rent due to increasing prosperity,

¹cf. *Report of the Royal Commission on Agricultural Depression*, Cd., 7400, 1897, particularly the evidence of Mr. C. S. Read.

²J. R. Bellerby, "Gross and Net Farm Rent in the United Kingdom, 1867-1938," *Journal of Agricultural Economics*, March, 1954, pp. 357-8).

³H. A. Rhee, "The Rent of Agricultural Land in England and Wales, 1870-1943," in *The Rent of Agricultural Land in England and Wales, 1870-1946*. Central Landowners Association.

a tenant, if his holding was for sale, could not lightly forgo the chance to purchase in case the sale was accompanied by a notice to quit and another farm to rent proved difficult to obtain. Despite the increasing prosperity, reflected in an increase in the average annual agricultural income of the United Kingdom from £119 million in the period 1894 to 1903 to £131 million in the period 1904 to 1910,¹ gross farm rents in England and Wales rose from £34.1 million in 1900 to only £34.7 million in 1908.² The incentive to landlords to sell was, therefore, undiminished.

The first statistics relating to owner-occupation refer to 1888. Prior to this date only general statements relating to the extent of this form of tenure are available, for example, Caird's statement in 1878 that the "... land of the United Kingdom may be said to be almost ... wholly cultivated by tenant farmers."³

Using the figures available for 1888, adjusted slightly to obtain comparability with those relating to 1908, the position was :—

Holdings over 1 acre	1888	1908
	%	%
Owner occupation of number of holdings...	14.5	12.8
Owner occupation of area of crops and grass	15.4	12.3

Sources : 1888—from *Agricultural Returns*, 1888, omitting the estimated number of, and area covered by, holdings of 1 acre and under.

1908—from *Agricultural Statistics*, 1908.

The striking thing about these figures is that, whereas in 1888 owner-occupation was more important when measured in terms of area than in terms of number of holdings, in 1908 the reverse was true. Accepting that farms in hand tend to be of larger than average size, the figures confirm that considerable farming in hand existed in 1888. The change in the figures in twenty years, and, in particular, their altered relationship, was produced by a combination of larger than average sized farms passing out of owner-occupation and smaller than average sized farms passing into owner-occupation. That this occurred is

¹E. M. Ojala, *Agriculture and Economic Progress*, p. 215.

²Bellerby, *op. cit.*

³James Caird, "General View of British Agriculture," *Journal of the Royal Agricultural Society*, 1878, p. 32.

supported by the annual reports of land agents published in the *Estates Gazette* during the period. It is also significant in this connection that in 1888 the average size of the owner-occupied holding of over 1 acre was about 64 acres compared with 61 acres in 1908; the average size of all holdings was about 63 acres in both years.¹

During the period 1867 to 1908 the inducements to own agricultural estates were severely weakened, both politically and financially. A readiness to sell land resulted. As agricultural conditions improved, unaccompanied by any marked rise in rents, land was often sold, sometimes to tenant-farmers, who, with increasing prosperity, were more frequently than formerly in a position to contemplate owning their land. This affected mainly small farms, the demand to rent large farms not being sufficiently great to lead a tenant to buy for fear of being served a notice to quit. At the same time, however, a decrease in owner-occupation occurred as farms in hand were let. By 1908, this letting was practically completed and only some large farms were being involuntarily farmed in hand.

II. THE INCREASE OF OWNER-OCCUPATION : 1909 to 1927.

Between 1909 and 1927 the extent of owner-occupation began to increase, slowly at first, then at increasing speed after 1917, culminating in a wild buying spree immediately after the war. Depression again struck British agriculture in 1921, temporarily halting the increase in owner-farming which, recommencing in 1924, was halted again in 1926. By 1927 the extent of owner-occupation was greater than it had been, probably since the seventeenth century.

¹Reflection will show that the combination of a decline in :—
the percentage of holdings owner-occupied by 2%
the percentage of acreage owner-occupied by 3%, and
the average size of the owner-occupied holding by 5%
could only be produced if large holdings move out of owner-occupation. When the difference in average size between owner-occupied holdings and all holdings is small, very large shifts of average-sized holdings into or out of owner-occupation are required to produce even small changes in the average size of owner-occupied holdings. Given the change in the extent of owner-occupation, the decline in the average size of owner-occupied holdings is significant as showing the impossibility of the changes being produced other than in the manner stated.

The published statistics relating to owner-occupation in this period show movements which, it is believed, did not occur. The statistics relating to the post-war years, 1919 to 1924 inclusive, were admitted as inaccurate.¹ For 1927, however, a careful and successful attempt was made to secure greater accuracy. The admittedly inaccurate figures will not be reproduced here. It is the contention of this paper that the published statistics for the years 1910 to 1914 are also inaccurate and do not accord with the other evidence relating to the period; this section will be largely concerned with this evidence.

In Table I are given what may be regarded as the reasonably accurate statistics relating to 1909 and 1927, together with the more doubtful figures relating to the years 1910-14. No statistics were collected after 1914 until 1919.

TABLE I
OWNER-OCCUPATION IN ENGLAND AND WALES, 1909 TO 1914
AND 1927
Holdings of over 1 acre

Year	Number of owner-occupied holdings	Percentage of holdings owner-occupied %	Area of crops and grass owner-occupied (acres)	Percentage of area owner-occupied %
1909	55,920	13.0	3,337,456	12.2
10	55,433	12.8	3,329,015	12.2
11	54,176	12.4	3,246,971	11.9
12	50,972	11.7	2,954,491	10.9
13	48,760	11.2	2,890,559	10.6
14	49,204	11.3	2,961,979	10.9
27	146,887	36.6	9,225,734	36.0

Source : *Agricultural Statistics, 1909 to 1914 and 1927.*

(a) *The pre-war period* : 1909 to 1914. It has been seen that land was being bought for owner-occupation in the years before 1909. After 1909, particularly in 1909-11, these purchases increased. Land agents from all over England and

¹*Agricultural Statistics, Part 1, Vol. 59, 1924, p. 5).*

Wales, reporting in the *Estates Gazette* were practically unanimous on this point. Land had been sold before 1909 without any marked increase in owner-occupation, but, whereas before 1909 estates were rarely broken up for sale, this was not the case in later years. "It has become very general to break up the large estates. . . . Farmers . . . cannot be sure of remaining on except by purchasing for themselves—this has created a new and large demand."¹ "Owing to the breaking up of . . . estates an enormous amount of land has been on the market, the greater portion of which has been purchased by the tenants."²

Additional evidence that land was sold extensively in these pre-war years is provided by the appointment of the Haversham Committee in 1911. As the terms of reference limited the inquiry of this Committee to the position of tenant farmers on the sale of their holdings, their report does not mention purchases of land for owner-occupation. In his minority report, however, Mr. H. Trustram Eve comments on the fact that farmers had frequently purchased land by raising both first and second mortgages, often from mortgagees who refused to accept repayments, either regularly or intermittently. It was, he said, ". . . under these unsatisfactory conditions that a very large quantity of farms have been purchased during the last two years."³

It is clear that in the years 1909-1914, farmers were purchasing farms for their own occupation. There is some evidence that credit difficulties may have acted as a brake on purchases in the years 1912-14. "It would appear . . . that in some parts of the country the mortgage market is tight, and that rates of interest for money borrowed for the purchase of farms are rising somewhat uncomfortably."⁴ Mortgages were sometimes called in when lenders became worried about their

¹Report of John Francis, Carmarthen, *Estates Gazette*, Vol. 78, 23rd December, 1911, p. 995.

²Report of Wheller & Laing, Exeter, *op. cit.*, Vol. 80, 21st December, 1912, p. 999.

³*Report of the Departmental Committee appointed to inquire into the position of tenant farmers on the occasion of any change in the ownership of their holdings*, (Haversham Committee), Cd. 6030, 1912, Minority report by Mr. H. Trustram Eve, para. 15, p. 24.

⁴*Estates Gazette*, Vol. 83, 3rd January, 1914, p. 19.

security. Some farmers had to give up farming in the years after 1912, as evidenced by the increased number of bankruptcies in the years 1912 and 1913. The numbers of Receiving Orders issued against, and Deeds of Arrangement entered with, farmers for the years 1905-14 were :

1905	..	389	1910	..	245
06	..	318	11	..	305
07	..	279	12	..	336
08	..	298	13	..	326
09	..	310	14	..	189

(*Figures by courtesy of the National Farmers Union*).

There is, however, no evidence that these influences were strong enough to cause an overall decline in the extent of owner-occupation such as that shown in the statistics reproduced in Table I.

There is a possible explanation, alternative to calling the statistics into question, of the difference between the course of events outlined for the years 1909 to 1914 and the statistics relating to the period. If, alongside of purchases of holdings for owner-occupation, there was extensive letting of farms in hand, it would be possible to reconcile the statistics and the argument of this paper. There is no doubt that some large farms which were in hand in 1909 had been let by 1914. If this had been the dominant factor in the period, a decline in the average size of the owner-occupied holding, as shown by the statistics, should have occurred, whereas an increase from 59·7 acres to 60·2 acres in 1914 is shown. A reconciliation along these lines between the statistics and the general evidence relating to the period is, therefore, impossible. The increase in the average size of owner-occupied holdings as shown by the statistics results from an incomplete record of the increase in owner-occupation, particularly of smaller than average sized holdings.

The combination of rising land prices and low rents, which led land-owners to sell their properties in the years immediately

before 1909, continued after 1909,¹ supplemented by the campaign against land-owners which was in progress at the time. This campaign moved from a mere vilification of landlords as a class, to threats of the nationalisation of land or the imposition of heavy taxes thereon. In this regard, the Finance (1909-10) Act, 1910, was crucial, in particular Form 4 on which land-owners were required to give particulars of their holdings. With this, the attack seemed to shift to cover all land-owners, not only the large landlords, and it is suggested that this shift of emphasis accelerated the break up of estates which commenced about this time. At the same time, the owner-occupier may have felt a strong incentive to hide the fact of his land-ownership. So long as only large estates were being attacked this did not apply, but once the attack was turned, or appeared to be turned, against all land-owners, the situation was different. However irrational it may now appear, at a time when it seemed to be regarded politically as almost a crime to own land, it is quite reasonable to suppose that land-owners took every opportunity to conceal the extent of their land-ownership.

There is no evidence that land was actually adversely affected by existing legislation, for example, taxes were only threatened, not imposed; the situation was "... a striking illustration of the evil that may be worked by mere threats of what is going to happen."² Added to this attack was the Agricultural Holdings Act, 1908, designed to give to tenants a much greater security of tenure than they had previously enjoyed, coupled with a freedom of cropping. This Act

¹Although rents were low in the period 1909-14, they were not falling. Lowness is relative; gross rents in England and Wales in 1909, estimated at £34.8 million, were low in relation to the £48.6 million of 1877. Between 1908 and 1914, gross rents rose from £34.8 million to £35.5 million; at the same time the ratio of net rents to gross rents for the United Kingdom rose from 48.7 per cent. to 52.0 per cent. ... (Bellerby, *op. cit.*). If these ratios applied equally to England and Wales, net rents must have risen from £17.0 million to £18.5 million. This being the case, landlords apparently had no incentive, if all other factors are disregarded, to sell their land after 1909, if they had not wished to sell it before 1909. However, at the same time, agricultural incomes had risen to an annual average of £142 million for the years 1911-13 compared with £119 million for 1894-1903 and £131 million for the period 1904-1910 (Ojala, *op. cit.*).

²*Estates Gazette*, Vol. 77, 14th February, 1911, p. 61).

appeared, at the time, to take from landlords the control of their land, and, far from giving greater security to tenants, land-owners steered around the Act by selling their properties. It is plausible to argue that, with an apparently water-tight security code for tenants, land-owners were no longer interested in retaining their land, and sold for that reason alone.¹

Tenants purchased their land, partly because they could afford to and, at the prices ruling, it often seemed to be a good investment, partly because the freedom of cropping and rights to compensation were not markedly better after 1908 than before, and partly because the farmer was not compensated for disturbance on the sale of his holding. The tenant had no security on the sale of the holding and knew that another holding to rent would be difficult to obtain if he had to leave that on which he was the sitting tenant. In 1913 tenants became entitled to compensation if disturbed after the sale of their holdings.

Having bought his holding for such reasons, the farmer, apparently was often not classed as an owner-occupier when the statistics of owner-occupation were compiled. This may, in some cases, have been because, having a mortgage on his holding with the mortgagee holding the title deeds, he was uncertain of his status. This could only apply to farmers who had purchased farms after 1909, the statistics for previous years appearing to be reliable. Much more important was the concealment of the fact of ownership; it was the success of these attempts which led to the statistics becoming deficient:

(b) *The War Years : 1915 to 1918.* During the war years, owner-occupation continued to increase, once the first period of uncertainty was over. The 1913 compensation provision might have been expected to lessen the willingness of tenants to buy their holdings; despite compensation the difficulty of finding another farm remained and farmers showed "... an increasing desire to purchase their holdings. . . ." ²

In the later years of the war, farmers had a taxation incentive to purchase their farms. With the general increases in

¹cf. H. M. Conacher, "The Relation of Land Tenure and Agriculture," *Journal of the Agricultural Economics Society*, 1936, p. 184.

²Report of Brodwell & Son, Nottingham, *op. cit.*, Vol. 90, 29th December, 1917, p. 60.

income taxation during the war, the basis of farmers' taxation assessments was changed. Whereas their taxable income from farming had been taken as equal to the rent or rental value of their holdings, it now became twice that amount in the absence of accounts showing a lower income. A tenant on an old estate where rents were low knew that if his farm was sold his rent would probably be increased, possibly to double its previous level. With the change in the basis of the taxation, this would have meant a further doubling of the taxation assessment to four times its previous level, to avoid which farmers were often anxious to buy their farms; rental values as calculated for taxation purposes tend to be extremely "sticky," being re-calculated only at intervals of three or more years.

On 5th April, 1917, the Corn Production Act came into operation. The guarantees given under this Act are usually cited as the cause of the increase in owner-occupation which the Agricultural Statistics show as beginning after 1919. It has been shown that, in fact, the increase began in 1909. Even without this Act, the increase in owner-occupation would have continued because of the high product prices and the high level of incomes ruling at the time.¹ Because of these prices, the guarantees given under the Act were not utilised, save for some small payments in 1920. The Act applied only to cereal growers, yet, as will be shown later, the greatest increases in owner-occupation occurred in counties other than cereal growing counties. In view of the fact that the increase in owner-occupation had started before the Act was passed, and that product prices were extremely high in the relevant years, it is impossible to credit the Act with more than a marginal influence on the number of owner-farmers.

(c) *The Post-war Years: 1919 to 1927.* The story of the years 1919 to 1921 is clear. Farms were in demand to rent and farmers, despairing of renting farms, were spilling over into the purchase market. "The scarcity of farms to let compels many farmers to purchase."² There was a demand for land from

¹The average annual agricultural income of the United Kingdom for the years 1920-2 was £327 million, compared with £142 million in 1911-13. (Ojala, *op. cit.*).

²Report of A. J. Burrows, Ashford, *op. cit.*, Vol. 95, 17th January, 1920, p. 118.

investors and from the newly-rich of the war. Tenant farmers themselves saw in their farms an investment for their surplus funds and a possible source of profit on re-sale. In addition, those farmers who remained tenants under a new landlord often found themselves, for example because of increased rents, in a less fortunate position than formerly; this encouraged other tenant farmers to purchase if they possibly could. In consequence, land prices were high, reaching an average of £35 per acre in 1920.¹

The high land prices had two main effects on land-owners. With rising costs of estate maintenance, net rents on estates often gave a very poor return on the capital invested and an even poorer return on the capital value of the land represented by the market sale price. Some landlords raised rents, particularly on a change of tenancy, but many preferred to sell their estates, leaving to the buyers the unpopular course of raising rents. Further, in 1919 a new basis of land valuation was adopted for the purpose of calculating death duties; the valuation became the sale price of land. In times of high land prices, such as 1920 and again in more recent years, this meant that the value of land for death duties exceeded the capitalised value of the income from that land. The new valuations, therefore, constituted a strong inducement for heirs to sell land, rather than other assets, in order to pay the duties.

Speculators often took a hand, selling land to farmers at inflated prices, but while many tenants bought their land as a consequence of threats of eviction, many others bought willingly. The period was one of enormous increase in owner-occupation. "With the continual breaking up of innumerable ancestral domains, all England seemed to be changing hands. . . ." ²

Landlords sold in the post-war years, not because they any longer feared legislative action against their class, but because of the low returns obtainable from land-ownership. For example, on an estate of about 25,000 acres owned by Lord Leconfield, gross receipts amounted to £31,961 in 1913, gross

¹D. K. Britton, "Sale Value of Farm Land between the Wars," *The Farm Economist*, December, 1949.

²*Estates Gazette*, Vol. 95, 3rd January, 1920, p. 12.

payments were £19,454, leaving a net return of £12,500, 10/- per acre. In 1920, the figures were £38,188, £31,378, and £6,800 respectively, a net return of little over 5/- per acre.¹ While the income from the land was halved, the sale value of the land had probably doubled, although there is insufficient evidence to be certain about this.

On 27th June, 1921, the reaction came. Agricultural product prices had fallen, and the government of the day, considering itself unable to afford the cost of the guarantees made in 1917, repealed the Act. Land prices fell, the demand for land shrinking rapidly. Owner-occupiers, who had bought at high prices in the expectation of continuing prosperity, often found themselves in difficulties and properties were lost to the mortgagees, or sold at reduced prices. Through the latter part of 1921 to 1923 there were few accessions to the ranks of owner-occupiers, save for landlords farming in hand unlettable farms. At the same time, owner-farmers were going out of business or becoming tenants of the former mortgagees of their farms. Bankruptcies among farmers rose from 44 in 1920 to 403 in 1922 and 472 in 1923, indicative of the difficulties of farmers and suggesting a decrease in the number of owner-farmers who, with high fixed payments, were particularly vulnerable to reductions in income. The extent of this decrease must not, however, be overstated. Despite the poor agricultural prospects, some land was still sold for owner-occupation. "Sales by auction of agricultural land have been fairly satisfactory, but in most instances the farms have been purchased by the tenants at greatly reduced prices. . . ." ² "The . . . growth in the number of new land-owners in this district, during the past year, is remarkable." ³

The main part of the increase in owner-occupation which occurred between 1909 and 1927 occurred in the years 1919 to 1921. The increase in this period, however, was not as large as is often supposed because increases, which are not fully recorded in the statistics, occurred in the ten years before 1919,

¹Mr. H. T. Watson, agent to Lord Leconfield, *ibid.*, Vol. 100, 4th November, 1922.

²Report of Rippon, Boswell & Co., Exeter, *ibid.*, Vol. 101, 6th January, 1923, p. 13.

³Report of W. Brown & Co., Tring, *ibid.*, p. 14.

and because the decline in owner-occupation in 1921-23 was made good within the next few years in another short period of increasing owner-farming.

The second period of increase was the two years 1924 and 1925. Land prices had recovered somewhat from the slump of 1921-22 and farm incomes had risen.¹ Those land-owners who were pessimistic as to the future prospects of agriculture, and hence the future level of land prices, saw in the rise in land prices an opportunity to sell. In particular, the commercial and industrial rich who had bought estates in the preceding ten or twenty years appear sometimes to have found it necessary to sell them at this time to free the money to support their businesses which were in difficulties.

An alternative explanation is that the land sales were induced by the Agricultural Holdings Act, 1923, in the same way as it has been suggested the 1908 Act might have caused some land to be sold. In the way of this explanation is the fact that the 1923 Act introduced no new legislation, being merely a consolidating Act, embodying the new legislation introduced in 1920. In the few instances where the reports in the *Estates Gazette* gave reasons for the increase in land sales, the reason given was the improved conditions of agriculture, although there are oblique remarks which could be interpreted as referring to the 1923 Act. Death duties were seldom mentioned.

Farms were in demand in 1924 and 1925, both for rent and for purchase, and a good deal of land seems to have been sold. "I know of one farm where there were 60 applications for it . . ." ² "Farms, small-holdings, and other agricultural property has had a ready sale and in most cases the tenants have . . . acquired the holdings which have been under their

¹The average sale value of farm land rose from £28.6 per acre in 1921 to £30.9 in 1925. (Britton, *op. cit.*). No continuous series of income figures is available, but a pointer to an increase in income is given by the general agricultural price index which rose from 157 in 1923 (1911-13 = 100) to 161 in 1924, while agricultural wages fell from 36/11 per week in 1921 to 28/- per week in 1924. Colin Clark gives the net output of agriculture as £104 million in 1924 and £146 million in 1925. (*National Income and Outlay*, p. 78).

²Mr. N. E. Buxton, *House of Commons Debates*, 5s., Vol. 169, Col. 1130, 1924.

cultivation."¹ This did not apply to large farms on which there may have been some farming in hand.

After 1925, land sales practically ceased and with them the increase in owner-occupation. By 1927 over one-third of the land of England and Wales was cultivated by its owners, compared with one-eighth in 1908, just before the increase started. The rate of increase was low in pre-war years, though faster from 1909-12 than from 1912-14. During the war years the rate of increase accelerated, reaching a peak in 1919-20. In 1921 and early 1922 the increase was temporarily suspended, some owner-occupancies reverting to tenancies. By 1923 it had recovered somewhat and in 1924 and 1925 there was again a significant rate of increase. This tailed off in 1926.

(d) *Summary : 1909 to 1927.* The changes which occurred between 1909 and 1927 are shown in Table II.

TABLE II
CHANGE IN THE NUMBER OF HOLDINGS AND AREA OF CROPS AND GRASS
AND IN THE EXTENT OF OWNER-OCCUPATION, ENGLAND
AND WALES, 1909 TO 1927

Size class	1909	1927	Change : 1927 1909
All sizes			
No. of holdings	430,812	401,734	0.93
No. of owner-occupied holdings ...	55,920	146,887	2.63
Percentage of holdings owner-occupied	12.98%	36.56%	2.82
Area of crops and grass (acres) ...	27,323,464	25,590,330	0.94
Owner-occupied area (acres) ...	3,337,456	9,225,734	2.76
Percentage of area owner-occupied ...	12.21%	36.05%	2.95
Over 1, not over 5 acres			
No. of holdings	90,405	74,331	0.82
No. of owner-occupied holdings ...	14,877	31,358	2.11
Percentage of holdings owner-occupied	16.46%	42.19%	2.56
Over 5, not over 50 acres			
No. of holdings	197,606	186,497	0.94
No. of owner-occupied holdings ...	26,352	66,382	2.52
Percentage of holdings owner-occupied	13.34%	35.60%	2.67
Over 50, not over 300 acres			
No. of holdings	127,772	128,384	1.00
No. of owner-occupied holdings ...	12,397	44,333	3.56
Percentage of holdings owner-occupied	9.70%	34.53%	3.56
Over 300 acres			
No. of holdings	15,029	12,522	0.83
No. of owner-occupied holdings ...	2,294	4,814	2.09
Percentage of holdings owner-occupied	15.27%	38.44%	2.52

¹Report of W. Easton & Son, Hull, *op. cit.*, Vol. 107, 9th January, 1926, p. 45.

The italicised figure which appears in the bottom right hand corner of each block in Table II will be referred to as the "Growth rate" of the group shown. The growth rates have been calculated by dividing the percentages of owner-occupation in 1927 by those for 1909; the same result is obtained, however, by dividing the change in owner-occupation between 1909 and 1927 by the overall change between those years.

The table shows two important things. It will be seen that the growth rate of acreage owned, 2.95, exceeds that of number of holdings owned, 2.82. This higher growth rate of acreage owned carried with it an increase in the average size of the owner-occupied holding, from 59.7 acres in 1909 to 62.7 acres in 1927, clearly indicative that larger than average sized holdings had passed from tenant occupation into owner-occupation. The average size of all holdings rose from 63.4 acres in 1909 to only 63.7 acres in 1927.

The table also shows that the number of owner-occupiers in the 50 to 300 acre size class was well below average in 1909 and that this was the main class to be affected by the increase in owner-occupation over the period. This can be attributed to the fact that, although the demand to rent farms in this size class was strong enough that few were farmed in hand in 1909, it was not strong enough to induce a farmer to purchase his farm for fear of being unable to rent another farm if served with a notice to quit. This applied particularly to farms of over 100 acres in size. The opportunities for land-owners to sell such farms were, therefore, limited. As the demand to rent farms increased and spread over the size classes, farmers lost the protection formerly enjoyed, and the farms, becoming more readily saleable, were sold. By 1927, this size class was not noticeably below average in number of owner-occupiers.

In 1909, the percentage of owner-occupation in the over 300 acre size class was high, pointing to the existence of some farming in hand in this class in 1909 and also to purchases of really large farms for extensive farming as a means of combatting the effects of depression before 1909. During the war years, when extensive arable production was profitable, large holdings sold readily and, in addition, there was probably an

increase in farming in hand by landlords wishing a greater share in the agricultural prosperity than was obtainable simply by raising rents. The low growth rate, 2.52, in this size class between 1909 and 1927, was not, therefore, due to a low level of sales for owner-occupation, but to a reduction of farming in hand in 1927 as compared with 1909, some of the holdings concerned being tenanted in the later year.

The position with regard to size classes applies also to counties, those counties with a low percentage of owner-occupation in 1909 tending to have a high growth rate of numbers of owner-occupiers between 1909 and 1927. In 21 counties in England the growth rate exceeded the average for England, 2.75, and in 18 of those counties there was, in 1909, a less than average percentage of holdings owner-occupied.¹ Of these 21 counties, 15 were counties with more than 60 per cent. of their area under permanent grass, that is pasture counties, and of the other six, none were cereal producers of any great importance. Pasture counties had, on the whole, a much lower percentage of owner-occupation in 1909 than the non-pasture counties, no doubt because livestock farmers, particularly before the introduction of machine farming, needed a larger capital investment per acre than arable farmers and hence a larger capital before they could contemplate purchasing their holdings. For the same reason, they had less reason to fear losing their holdings should their landlords decide to sell. By 1927, there was no one type of farming in which owner-occupation appeared more or less important than in other types.

It is clear, therefore, that although the numerical growth in owner-occupation may have been somewhat larger in grain growing counties—which were affected by the 1917 Act—in

¹The 21 counties are :—

County	Growth rate	County	Growth rate	County	Growth rate
Bedford	2.90	Kent (*)	2.82	Shropshire	3.81
Cheshire	4.34	Lancashire	3.16	Somerset (*)	3.06
Cornwall	3.46	Leicester	3.50	Stafford	3.21
Derby	3.03	Lincoln	2.84	Warwick	2.85
Devon (*)	3.15	Monmouth	2.83	Worcester	2.76
Dorset	3.38	Nottingham	2.78	Yorks. E.R.	3.04
Hereford	3.46	Rutland	3.02	N.R.	3.67

Counties marked (*) are those with a greater than average percentage of owner-occupation in 1909.

the 1909-27 period, the greatest proportionate increases did not occur in such counties. The main growth occurred in those counties and in that farm size group in which owner-occupation had been weakest before 1909, that is, generally, where the opportunities for land-owners to sell their land had been most restricted.

III. THE PERIOD OF CONSOLIDATION : 1928 TO 1950.

These 23 years cover depression, war, a period of post-war uncertainty and the first three years' operation of the Agricultural Act, 1947. What variations occurred in the extent of owner-occupation in these years is not known at all exactly. The only figures available relate to 1927, 1941 and 1950 ; they are given in Table III.

TABLE III

Year	Number of owner-occupied holdings	Percentage of holdings owner-occupied	Area of crops and grass owner-occupied (acres)	Percentage of area owner-occupied %
1927	115,529	(Holdings over 5 acres) 35.3	9,129,167	35.8
41	103,200	34.6	7,968,600	32.7
41	104,600	(Holdings of 5 acres and over) 34.7	7,980,000	32.7
50	115,300	39.0	9,100,000	38.0

Sources : 1927—Collected from the *Abstracts of Parish Returns of Acreage of Crops, 1927*.

1941—Calculated from the *National Farm Survey of England and Wales, 1941-3 and Agricultural Statistics, 1941*.

1950—Calculated from "Tenure and Size of Holdings (England and Wales)," Press release, MAF 3088, 1952.

The figures shown for 1941 in the table were calculated by using the percentages of owner-occupation given in the Farm Survey with the statistics relating to the number and acreage of holdings given in the Agricultural Statistics for 1941. Using the percentages in this way is, in itself, a questionable procedure, necessitated by the impossibility of comparing the Survey results with any figures for other years owing to unspecified differences in definition. Further, the Survey percentages themselves may be inaccurate. The Survey results were based

on a 14 per cent. sample of all returns received. For a part of eastern England covering 14·7 per cent. of the cultivated area of England and Wales, the extent of the owner-occupation of the area of crops and grass has been calculated using all the returns received from the area.¹ The differences between these results and those shown by the Survey for this area are apparent. The figures are :

County	Survey	Cambridge Study	County	Survey	Cambridge Study
	%	%		%	%
Bedford...	40	38·6	Lincs., Holland	39	43·8
Cambridge	29	35·4	Norfolk...	37	37·6
Essex	51	53·2	Peterborough	18	24·8
Hertford	30	31·7	Suffolk, East	47	49·8
Huntingdon	30	33·5	West...	48	50·5

These differences are often considerable and all bar one are in the same direction, suggesting that overall the Survey might underestimate the extent of owner-occupation in 1941 by about 2 per cent. The Survey report, in discussing the statistical techniques used, gives the maximum sampling error as about 0·21 per cent. in the overall extent of owner-occupation by area and 1·6 per cent. in the case of an average sized county. In seven of the counties shown above the error exceeds this figure, suggesting but not proving, that the overall error might be considerably greater than the figure of 0·21 per cent. For this reason the results of the Farm Survey cannot be regarded with any great confidence.

The 1950 figures are even more questionable. Rough grazings were included in the figures and had to be excluded for use here, giving opportunity for errors to occur. Further, the figures are based on incomplete data, completed returns being received from only 256,880 holdings out of 380,000 recorded. No indication is given respecting the adjustments made to take account of missing returns. There appears to be no ground for assuming that the returns received represented a fair sample of all holdings. The request to have access to the data on which the figures were based was refused on the ground that the data were not sufficiently accurate to be further worked on.

¹*Land-ownership in the Eastern Counties, 1941*, Department of Agriculture of the University of Cambridge, pp. 28-32.

It is clear that no precision can be given to the discussion of owner-occupation for the years after 1927. The period will, therefore, be discussed in general terms under three headings.

(a) *The Pre-War years: 1928 to 1939.* The position of agriculture in these years is clearly shown in the net output figures given in Table IV.

TABLE IV
VALUE OF THE NET OUTPUT OF AGRICULTURE IN THE UNITED KINGDOM IN GROUPS OF YEARS, 1904-10 TO 1935-39

Years	Value of net output	Years	Value of net output
	£m.		£m.
1904-10	135.03	1924-29	157.34
11-13	147.09	30-34	139.57
20-22	332.97	35-39	158.53

Source : Ojala, *op. cit.*, p. 61.

These figures do not represent the incomes of farmers, two big items, wages and rent, needing to be deducted besides numerous smaller items, such as rates and depreciation, in order to yield net income.

In the early 1930's, the value of the net output was only a little higher than in the period 1904-10, years of no more than quiet prosperity. The mid-years of the two periods, 1906 and 1932, respectively, may be compared :

			1906	1932
Index of farm wage rates	...	...	51	98
Index of rents	...	...	74	80
Cost of living index	...	...	93	144
Number of holdings	...	...	431,806	390,469

It is clear that farmers' real incomes fell considerably between the two periods, despite the rise in the value of the net output. At the same time, however, the number of farmers having to share that real income fell.

Owner-occupiers were particularly hard hit by the depression as their mortgage payments, contracted in times of high land and product prices, were fixed while their incomes fell. Many, in consequence, failed and the mortgagees foreclosed.

"Several farms have been sold where farmers have been pressed by mortgagees."¹ Others sold out and cut their losses, often selling their mortgaged farms at prices "... much less than the original mortgage value of the holdings."² Selling owner-farmers frequently became tenants of the purchasers of their farms. The annual figures of bankruptcies among farmers for the years 1928 to 1939 tell plainly the story of the difficulties of these years. The figures are :

1928	487	1932	560	1936	215
29	345	33	428	37	258
30	350	34	288	38	252
31	497	35	224	39	201

Figures by courtesy of National Farmers Union.

After 1939, it was not until 1951 that the number of bankruptcies again exceeded 100 in any year.

After 1934, a period of purchasing of small farms for owner-occupation occurred : "... the majority of our sales ... have been to purchasers acquiring for occupation."³ The total of land sales reported in the *Estates Gazette* rose from £4.6 million in 1931 to £6.9 million in 1935, the rise continuing until the outbreak of war, although there was a set-back in late 1937 and in 1938. Despite these purchases for owner-farming there was a decrease in the number of owner-occupied holdings for three reasons. Farmers who had hung on during the early 'thirties because they feared any such settlement of their affairs as the sale of their farms would involve, often took advantage of more buoyant conditions to sell. Mortgagees who had refrained from foreclosing on farmers during the worst of the depression, took advantage of improving conditions and higher land sale prices to enter into possession of the holdings of farmers in arrears. Thirdly, during the most depressed years, land-owners and mortgagees-in-possession often farmed land in hand, letting it later when conditions improved. By

¹Report of G. Tarn Bainbridge, Son & Handley, Darlington, *Estates Gazette*, Vol. 111, 14th January, 1928, p. 52.

²Report of W. & H. Peacock, Bedford, *ibid.*, Vol. 117, 10th January, 1931, p. 56.

³Report of Jackson, Stops & Staff, London, *op. cit.*, Vol. 125, 19th January, 1935, p. 107.

1934, land agents could speak of "... land-owners and mortgagees who were forced to take over in the bad times (being) able to hand over again to responsible tenants..."¹ These things occurred mainly in 1934 and 1935. In 1936 it appears that the number of owner-occupiers increased slightly, although this increase was halted in 1938.

Comparing the 1927 and 1941 statistics for owner-occupation in three size classes, it is quite clear where the main decline in owner-occupation occurred. The percentages of numbers of holdings owner-occupied in the two years in England and Wales were :

Size class (acres)				1927 %	1941 %
5 - 100	...	...	...	35.4	35.7
100 - 300	...	...	...	34.8	31.3
300 plus	...	...	...	38.4	33.5
Total	...	...	...	35.3	34.6

Even making allowances for possible inaccuracies in the 1941 percentages, it is clear that owner-farming decreased most noticeably in the 100 to 300 acres size class. The decline in the over 300 acre size class was greater in terms of percentages, but represented only 800 holdings. It has already been shown that it was in the 100 acres to 300 acres farm size class that the greatest increase in owner-occupation occurred before 1927. The decline in this size class between 1927 and 1941 can mainly be attributed to the burdens of debt incurred by owners at the time of purchasing their farms; it constitutes one more example of the vulnerability of farmers with a high level of fixed charges in times of falling prices.

(b) *The War Years: 1940 to 1946.* After 31st December, 1941, Defence Regulation No. 62 provided tenants with security of tenure on the sale of their holdings. This removed a powerful incentive for tenants to purchase their holdings, but, by giving the tenant security, it led to a shortage of farms to rent so that only by purchasing a vacant farm could a prospective new entrant to farming gain a place. As a result, vacant farms commanded higher prices than tenanted farms, the difference,

¹Report of Arthur Rutter, Sons & Co., Bury St. Edmunds, *op. cit.*, Vol. 124, 29th December, 1934, p. 1057. "Being" substituted for "have been" in the text.

the vacant possession premium, reaching on average 76 per cent. of the price of tenanted farms for the three years 1944-6.¹

Some owner-occupiers, particularly the owners of holdings over 200 acres in size, sold to investors during the war, obtaining long-term leases and having the capital formerly invested in their land free for farming purposes. Overall, however, the prosperous war years were years of some increase in owner-farming although, tenants being secure in their tenure, prosperity did not lead to the same sort of increases in owner-occupation as occurred during the first war.

(c) *The Post-war Years: 1947-1950.* In 1947, the Agriculture Act came into operation. This guaranteed prosperity to farmers and gave them such things as security of tenure, freedom of cropping and protection against arbitrary increases in rents. Most of the effects of the Act on owner-occupation have been discussed in another place.² Here, only brief mention will be made of the effects of the continuing and guaranteed prosperity on owner-occupation.

Owner-occupation increased on the one hand because of increasing purchases of farms by new entrants to the industry. "The demand for properties with vacant possession still remains high . . ." ³ As a result, the vacant possession premium rose to a level of 108 per cent. on average for the years 1949-51. The existence of such a premium constitutes a strong inducement for the owner of a vacant farm to sell it rather than re-let, further reducing the supply of farms to the rental market. The rental provisions of the Act strengthened this tendency as, although an owner can ask what rent he likes for a vacant farm, he can only be sure of receiving that rent for three years, after which the tenant can appeal to arbitration on the rent.

Owner-farming also increased because of the continuing break-up of agricultural estates. "The break-up of large agricultural estates continues and has emphasised the willingness

¹J. F. Ward, "Changes in the Sale Value of Farm Real Estate in England and Wales, 1937-9 to 1951," *Farm Economist*, August, 1953.

²"Owner-Farming and the 1947 and 1948 Acts," *Journal of the Agricultural Economics Society*, 1955.

³Report of Jackson, Stops & Staff, *Estates Gazette*, Vol. 156, 30th December, 1950, p. 488.

of tenants to buy their farms . . ." ¹ In part, this has been the result of death duties which fall severely on agricultural land, despite the agricultural rebate of 45 per cent. In part, it is a direct consequence of the provisions of the Acts, for, as was argued earlier, complete security for tenants is probably incompatible with a landlord/tenant system. But in part, also, the poor returns from land-ownership are responsible for the break-up of estates. This also has reference to estate duties. The value of agricultural land at present usually exceeds its earning power capitalised at the current rate of interest. This means that a man, having to sell assets to meet a claim for estate duties, can retain for himself a larger income by selling land rather than non-agricultural assets.

The low returns from land-ownership in the period are indicated by figures collected from a sample of 800,000 adjusted acres. For 1938 these show gross rent as 25/8 per adjusted acre, while expenditure on maintenance and statutory charges amounted to 11/- per adjusted acre, and expenditure on improvements to 4/2, leaving a net rent of 10/6 per adjusted acre. On the same sample in 1950, the figures were 31/6, 20/8, and 15/10 respectively, giving a negative net rent of 5/- per acre.² These figures must be regarded with some caution as there is reason to believe that the sample is not a representative one. Further, although it is justified to charge the whole expenditure on improvements to gross rent in arriving at net rent in a period when the annual expenditure has been of a constant amount, this is not so in a period of rising annual expenditure as in 1950. The figures can, therefore, be regarded as no more than indicative of changes which have occurred. Even if taken as only indicative, however, at a time when the sale price of tenanted land rose from an average of £22.5 per acre in 1938-40 to £46.7 per acre for 1948-50, it is small wonder that land-owners wished to sell their land.

It is of interest in view of these figures to glance at net rents over the years covered by this paper. In the period

¹Report of Chesshire, Gibson & Co., Birmingham, *ibid.*, Vol. 157, 13th January, 1951, p. 33.

²*An inquiry into Agricultural Rents and the Expenses of Land-owners in England and Wales, 1950 and 1951*, 'Country Land-owners' Association, pp. 28, 32.

1872-6 net income from land was about 57 per cent. of gross rents,¹ that is, about 16/- per acre. At the beginning of the present century net income represented 65 per cent.² of a smaller average gross rent, and was about 13/6 per acre. By 1928-29 the net income of land-owners had fallen to about 43 per cent. of the gross rent,³ that is, about 10/4 per acre. This level was more or less stable until after the war.

IV. Post 1950.

The trends of the years 1947 to 1950 show no sign of being reversed. Although rents are gradually rising,⁴ estate duties bring some estates into the market each year and when the farms are sold the tenants are frequent purchasers. No figures of the extent of owner-occupation have been collected since 1950; as a guess it is suggested that about one-half of the farmers of England and Wales now own their farms. Even if owner-occupation does not become the predominant tenurial form in the not too distant future, it is unlikely quickly to become again so unimportant as it was in 1908.

The post-war experiences have high-lighted two important points. The first is that farmers prefer to remain tenants so long as agricultural land is under-rented, but are willing to become owners when rents approach economic levels. The second is that security of tenure has not resulted in tenants abandoning the land market, but has stopped them paying exorbitant prices for their farms. On the other hand, new entrants to farming have paid very high prices for vacant farms⁵ and are likely to be in an extremely uncomfortable position if agriculture should again become depressed.

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¹R. J. Thompson, "An inquiry into the rent of agricultural land in England and Wales during the 19th century," *Journal of the Royal Statistical Society*, 1907, p. 603.

²*Ibid.*, p. 605.

³W. C. D. Dampier-Whetham, "The Economics of Rural Land-owning," *Journal of the Agricultural Economics Society*, December, 1930, p. 59.

⁴The average rise in gross rents appears to have been about 15 per cent. between 1950 and 1953.

⁵In the period 1952-4 the average sale price of vacant land was £84 per acre, compared with £41 per acre for tenanted land.

Some Aspects of Urban Development by Colliery Companies, 1919-1939

When control over land development and the ownership of land were vested in the same person, the development undertaken was usually of a kind which gave the greatest satisfaction, or return, to the developer. Such development, however, was not always advantageous to the community at large. The Town and Country Planning Act, 1947, seeks to remedy the disadvantage to the community by vesting the control of land development in local planning authorities without affecting the ownership of land. Now, so far as the protection of the community's interest is being achieved, it is often at the expense of the private interest.

One danger inherent in present planning law is that the claims of certain industries for particular forms of development may be ignored on the grounds that such development is inimical to general welfare, as a result of which these industries are obliged to operate at a disadvantage. The loss of welfare is usually more apparent than the economic handicap which may have been placed on an industry or firm and is consequently more easily recognised. It may well be that in making a decision as to the future development of land the best interests of the landowner have to be discounted for the general benefit of the community, but this decision ought to be made in full knowledge of the extent of the landowner's loss.

The purpose of this paper is to explain why colliery companies found it necessary to undertake urban development between 1919 and 1939, and why they built as they did. In so far as the methods adopted were to meet problems particular to the coal industry, it is possible to obtain some idea of the consequences of adopting alternative solutions desirable on the grounds of planning in the interests of the community at large.

The circumstances under which a mining industry is obliged to provide accommodation for its workers are well known. A mining industry is nomadic in that it is constantly

obliged to find fresh mineral deposits to replace those worked out, and the continual movement of the centre of production calls for a high degree of labour mobility on the part of miners. The changes in the location of the industry become greater as it grows older with a correspondingly more urgent need for a mobile labour force.

In a highly developed urban society, large-scale migrations of workers depend on an adequate number of houses being available in the reception areas. If these areas are already urban in character, the steady increase in local demand occasioned by the influx of population normally stimulates the market into providing more houses, while in the meantime existing accommodation is more intensively used. But if mining moves into a district where the density of population is low, the prospects of having houses ready for the workers when the shaft has been sunk are remote unless the mining company itself is willing to build. Evidence given before the Select Committee on Coal, 1873, the Royal Commission on Mines, 1907-08, the Sankey Commission, 1919, and Tremenhoe's Reports¹ makes it clear that the British coal-owners seldom wished to build for the sake of doing so, but were obliged to act when new mines were being opened in sparsely-populated districts. In such areas the local demand for mining labour was strong and could usually only be satisfied by miners elsewhere being induced to move. This movement might either be from other parts of the same coalfield where coal production was declining² or from other coalfields in which the demand for labour was weaker. But whether the migrants came from near or far the colliery companies had to build houses in order to establish a stable labour force; it follows, therefore, that the greater the expansion of the industry in a given period, the greater the number of houses built by the colliery companies.

Between 1919 and 1939, the demand for labour in the industry as a whole was weak, output in 1939 was 0·7 per cent. higher than in 1919, but was produced by a labour force

¹Reports of the Commissioner Appointed under the Provisions of the Act 5 & 6 Victoria c.99.

²For a typical example, see "The Development of the Ayrshire Coalfield," J. H. Lebon, *Scottish Geographical Journal*, Vol. XLIX, 1933.

34.5 per cent. smaller.¹ The restrictions placed on entry into the industry by the Mining Industry Act, 1926, the high rate of unemployment among miners and the steady flow of population from the coalfields to the Midlands and the South were all signs that the supply of mining labour was generally in excess of demand. In these circumstances the amount of building which the colliery companies undertook was not large, and because motor transport gave much greater flexibility to daily journeys, it was hardly necessary to build houses at all to secure the redeployment of labour within a coalfield. In all the older coalfields unemployment among the miners was such that men were prepared to travel considerable distances to work, and it was unnecessary to offer men houses as an inducement to work in pits which needed labour.² But there are limits to the distance which men can travel to work each day, and in those coalfields where new mines were being sunk to replace the output of exhausted mines in the older fields, such as Lancashire, Durham, South Wales and Lanarkshire, there was a need for workers which could only be satisfied if men would move with the industry. The coalfields where miners were needed most urgently were South Yorkshire, Nottinghamshire, North Derbyshire and, later, Kent. In all these places the sites of the new mines were in districts hitherto given over almost entirely to agriculture, there was little suitable labour to be had locally and recruits were sought in mining villages where the local pits could no longer provide work for the population dependent upon them.

Table I shows the distribution of colliery-built houses between 1919 and 1925; the three coalfields of South Yorkshire, Nottinghamshire and North Derbyshire account for 53.7 per cent. of the total, although they employed only 17.7 per cent. of the total labour force in 1919. The reason for the concentration of building here was to provide houses for immigrant labour. No figures are available for the period after 1925, but this is not a serious deficiency since the bulk of the development undertaken by the colliery companies between 1919 and 1939 had been completed by 1925. The only

¹*Statistical Abstract for the United Kingdom.*

²Daily journeys of up to 20 miles each way were not unusual.

TABLE I
NUMBER OF HOUSES BUILT BY, OR ON BEHALF OF COLLIERY
COMPANIES FROM 1919-1925 (COVERING 97% OF
INDUSTRY BY OUTPUT)

COALFIELD	Houses Let Free of Rent	Houses Let at a Rental
Northumberland	6	54
Durham	—	47
Cumberland and Westmorland	—	164
Lancashire and Cheshire	1	452
South Yorkshire	—	4,515
West Yorkshire	—	153
Nottingham	—	725
Derbyshire (except South)	—	1,220
South Derbyshire	—	—
North Staffordshire	1	3
Cannock Chase	—	122
South Staffordshire and Worcestershire...	—	—
Leicestershire	—	16
Warwickshire	—	584
Shropshire	—	—
Forest of Dean	1	—
Somerset	—	—
Bristol	—	—
Kent	—	33
South Wales and Monmouth	7	1,525
North Wales... ..	—	420
TOTAL ENGLAND AND WALES ...	16	10,033
Fife and Clackmannan	—	643
Lothians (Mid.and East)	2	283
Lanark, Linlithgow, Stirling	12	833
Ayr, Dumfries and Argyll... ..	4	221
TOTAL SCOTLAND	18	1,980
TOTAL GREAT BRITAIN	34	12,013

Source : *Royal Commission on the Coal Industry, 1925, Volume III, Page 248.*

significant omission from the Table is building which took place in Kent in the late 1920's, although in relation to the fields already mentioned this development is not of great importance. After 1925, the industry as a whole suffered severely from the economic depression, and the Coal Mines Act, 1930, under which an output quota was laid down for each coalfield, tended

to stabilise the location of the industry. This had the effect of curtailing any further new developments that might have been contemplated.

It is proposed to deal with two aspects of urban development undertaken by the colliery companies, namely, the method adopted to finance the work, and the location of the new villages in relation to the mines in which it was intended the inhabitants should work. The study of the finance of the development is important because it shows that the responsibility for building colliery villages was accepted as being just as much part of mining as sinking the shaft, and indirectly, it illuminates a weakness of local authorities in building houses for the coal industry.

FINANCING THE DEVELOPMENT.

The development of land is normally an end in itself, that is, to satisfy demand for that particular type of development, but the building of a mining village by a colliery company was only a means to an end ; the work was undertaken in order that the mine might be worked. Whereas the availability of labour is an important factor in determining the location of most industries, this has much less significance in mining since the mine must be sited at the source of the raw material. Instead of being attracted by a pool of labour, the mining company must establish its own, and the development of land which makes this possible is regarded as part and parcel of the process of mining.

It has long been recognised that where some given part of an industrial process requires an optimum scale of production considerably greater than most of the firms of an industry can achieve, this process tends to be separated from the main industry and is then carried on by specialist firms.

In 1919, the British coal industry, or rather the expanding portion of it, was ready for vertical disintegration in that a specialist firm was needed to construct mining villages. The reasons for this were varied. The increasing numbers employed in modern mines make the building of a village to accommodate its workers a major technical operation for which the ordinary staff of a mining company were quite unsuited. The capital

cost was extremely high ; Table II shows the proportion of the total cost of the venture needed for housing might amount to 48.6 per cent. and was not likely to fall below 38 per cent. This was a particular embarrassment in view of the high cost of sinking and equipping the mine itself, especially as it was difficult to raise capital for the industry. These troubles were not alleviated by the fact that it was scarcely profitable to build houses for letting at this time, especially as it was obviously better to keep rents as low as possible since the houses were to encourage labour migration. It was fortunate that there was an instrument to hand which solved most of the problems, this was the public utility society, or housing association.

TABLE II
COST OF HOUSING AS A PROPORTION OF COST OF EQUIPPING
A COLLIERY, 1925

	Estd. Weekly Output in 000 tons	Total Cost (inc. houses)	Cost of Houses	Cost of Houses as Percentage of Total Cost	Number of Houses
Colliery A ...	30	£1,940,000	£900,000	46.4	1800
„ B ...	20-25	£1,900,000	£750,000	38.9	1500
„ C ...	23	£1,602,000	£750,000	46.8	1500
„ D ...	20-25	£1,872,000	£750,000	40.1	1500
„ E * ...	20	£1,960,550	£550,000	28.1	1100

*Figures for this colliery vary because total cost includes 10 years accumulated interest during the process of sinking and development.

This has not been allowed in other cases.

Source : *Royal Commission on the Coal Industry, 1925*, Volume III, Appendix 31.

In 1919, public utility societies had already been formed to undertake building at Letchworth, Hampstead Garden Suburb and also one or two colliery villages in South Wales and Yorkshire, so that there was nothing new in the idea, but the society which was eventually formed to serve the coal industry was different from its predecessors in its organisation and purpose. Briefly, such societies were registered pursuant to the Industrial and Provident Societies Act, 1903, and offered

limited interest on money invested in them (usually 5 per cent.), but they could borrow money at low interest rates, repayable over a long period, from the Public Works Loan Board. The housing associations which had built mining villages before 1914 had been formed by the colliery companies that needed the houses, and had existed simply to build one village; each one was, in effect, a subsidiary of the colliery company. But while this form of organisation solved the difficulties of raising capital for building operations, it did not overcome the technical difficulties for the individual associations were not of sufficient size to employ the professional staff which was desirable. To obtain the benefit of economies of building on a large scale, it was necessary for the firm responsible to have a much larger programme of work than the construction of just one village. This advantage was achieved by a public utility society which existed to build houses for the coal industry not just one firm.

In 1922, twenty-four colliery companies operating mainly in the coalfields of South Yorkshire, Nottinghamshire, and North Derbyshire, sponsored the formation of the Industrial Housing Association (I.H.A.) to finance and carry out building projects for the coal industry. The Association raised loans to finance its work, designed the villages and either built them with its own labour or else supervised the work of contractors whose tenders had been accepted. The choice of site, however, was left to the colliery company on whose instructions the village was built.

The bulk of the houses shown in Table I were built by the Association at comparatively little cost to the industry. A colliery company requiring houses to be built by the I.H.A. subscribed for shares equal to the cost of the houses, although only 10 per cent. of the nominal value of the shares was paid up. The remainder of the Association's capital was raised by loans from the Public Works Loan Board, subsidies and from private sources.

In the six years following its formation, the I.H.A. built approximately 12,000 houses. These were let to the colliery companies concerned on full repairing leases for thirty years at rents sufficient to cover interest and sinking fund charges. At

the end of 30 years the houses became the property of the colliery company which had taken the lease.

The rents charged by the colliery companies to the tenants were the same as those charged by the Association, and varied from about 8/- to 12/6 weekly, the tenants paying rates. The cost to the colliery companies therefore amounted to ten per cent. of the initial outlay and thereafter the annual maintenance costs. The housing subsidy of £6 per annum was passed on to the colliery companies and in turn was used to reduce the rents of the houses.

During its six years of intense activity, the I.H.A. spent approximately £6,000,000. Of this money, the bulk was advanced by the Public Works Loan Board which also loaned money to one or two smaller housing associations formed by individual companies. Altogether the Board made £5,998,640 available to the coal industry at this period to finance the construction of 15,447 houses.¹

At first sight it seems strange that the colliery companies should have gone to the trouble of sponsoring an organisation to build houses with public funds when, in 1919, local authorities had been placed under a statutory obligation to provide small houses for letting; especially as colliery-owned houses had been one source of bitter friction in labour relations within the coal industry. But a report of the work of the I.H.A. discloses serious weaknesses on the part of local authorities seeking to build houses for migrant labour.² Local authorities normally have waiting lists for houses and consequently find it embarrassing to let houses to migrants, particularly as those on the waiting list are already electors.³ From the colliery companies' point of view the inability to guarantee a new worker a house after a short period of employment was sufficient to make them build themselves, but there were other reasons why the local authorities were regarded as unsuitable. The

¹Reports of the Public Works Loan Board.

²"Building of 12,000 Houses"—Sir John Tudor Walters.

³This embarrassment is more acute in times of general housing shortage, *e.g.*, since 1945 many local authorities have refused to permit applicants to go on the waiting list for houses unless two years' residence in the district can be proved. The Town Development Act, 1952, is intended to overcome this difficulty.

new mines were being sunk in rural areas in which the local authorities had barely the knowledge or resources to carry out schemes on the scale required, while their methods of procedure were not suited to rapid development. One colliery owner before the Samuel Commission described how it had been necessary on one occasion for his company to loan the local council money to finance the construction of roads and sewers in connection with the new village that was under construction for the company.¹ Such local authorities could hardly have managed the whole scheme, and generally the function of the local authorities in relation to the villages built by the I.H.A. was to add more houses once the original plan had been fulfilled.

LOCATION OF THE NEW VILLAGES.

The siting of the new colliery villages in relation to the mines is perhaps of greater current importance than methods of financing development, because almost invariably they were located in positions which most planners would regard as highly undesirable. This was not due to any careless disregard or ignorance of the standards of good planning for in other respects the development was of a high quality, the influence of the garden city movement in particular being worthy of close attention.

With the exception of one or two estates in Kent, the mining villages after 1919 were built close to the colliery gates ; in rare instances there might be a mile between the pit and the homes of the miners, but usually the distance was a matter of hundreds of yards. The choice of site was deliberate and sometimes made in spite of the fact that there was an existing settlement within a reasonable distance to which new houses might have been added instead of making a new village.

The location of colliery villages has been one of the main targets of criticism from planners in respect of urban development in the coalfields, but it is at this point that the interests of the industry and general welfare of the community are diametrically opposed.² The reason for the continuation of

¹*Royal Commission on the Coal Industry*, 1925, Vol. II, Qu. 11283.

²At this point a cogent argument could be put forward to show that anything which was for the benefit of the coal industry would increase general welfare, but this would lead to a major diversion from the limited object of this paper.

previous practice is not hard to find. The companies were building in order that they might recruit labour; having persuaded a man to move from, say, Durham to Yorkshire and provided a house for him, they had no wish to see him begin working for someone else after a short period in their employment. The further away the new recruits were from alternative sources of employment, the less attractive those other jobs were likely to be, and the place furthest from other employers was next door to the mine. Not only did this location serve to discourage the workers from taking other jobs, it also encouraged boys to enter mining, when they left school, by daily suggestion that mining was the natural trade of the village; this suggestion would have been much weaker, if not altogether lost, had the village been out of sight of the mine. There is, of course, the argument that if the village had been built two or three miles from the pit, then it would have been more desirable to live in and therefore would have attracted labour more readily, but this was an argument the colliery companies were unwilling to accept. In any case, it is quite obvious that the smaller the competition from other employers, the easier is recruitment for the coal industry.

A strong argument in favour of siting the village away from the mine is that to do so would make it easier to introduce a greater diversification of industry. This is probably true, but it is also tolerably certain that greater diversification of industry would increase the difficulties of recruiting labour for mining. Even if the industries introduced were chiefly employers of female labour, experience since 1945 suggests that this might increase absenteeism.

The fact that contemporary colliery villages abroad were also built as close to the mines as possible tends to confirm the view that the sites were chosen to give some particular advantage to the industry, and the choice was not due to an ignorant observance of an out-moded tradition on the part of the employers. Villages built at this time in France, Belgium, Germany and the U.S.A. were commonly located in the same relative position as those in the expanding coalfields of Britain. It is also interesting to note that these villages were built by

housing associations with capital which would not otherwise have been available to the mining industry.

All this is not to suggest that good planning is impossible in coal-mining areas and that coal should be produced by workers consigned to live in something akin to a frontier outpost cut off from the rest of society, nor is it to suggest that miners should be housed so as to ensure that the largest proportion of their sons is recruited for pit work. But those in control of future urban development in the coalfields ought properly to count the full cost to the industry of proposals to remove the colliery village from its traditional place.

POSITION AFTER 1939.

Since 1939, the economic condition of the coal industry has radically changed. Ownership is now vested in the National Coal Board and the surplus of mining labour which existed for so long before the war has changed into a labour shortage. The latter condition was, in the past, responsible for the greatest building activity on the part of the coal owners, but at first the N.C.B. was content to rely on the local authorities to complete the building required by the industry. There was sufficient reason for pursuing this course.

The reports of the Regional Survey Committees appointed by the Ministry of Fuel and Power in 1944 and 1945 were almost unanimous in recommending that in the future miners' houses should be built by local authorities, and the technical problems were considerable because of the scarcity of materials. But the weakness of local authorities in providing houses for immigrant labour, noted by the I.H.A., still existed, and successive reports of the N.C.B. and the Man-power Committee of the National Consultative Council for the Coal Industry, in 1948, drew attention to the fact that the expansion of production was impeded by the shortage of houses. At a time of general housing shortage some complaint of this kind is inevitable, but the significant thing is that since 1947 a measure of priority had been given to housing for miners, and regional committees were established, on which were representatives of the Ministry of Health, the N.C.B. and local authorities, charged with making the priority effective. No reasons appear to have been given

for the disappointing results which followed, but the Board cannot have been satisfied to leave the responsibility for building miners' houses with the local authorities since it was announced, in 1952, that a housing association had been formed by the Board.

The announcement stated that additional houses are to be built by the Association in those coalfields where men are most needed and "where it would place an undue burden upon the local authority to provide the extra houses." This is, of course, a resumption of the work which colliery companies carried out in similar circumstances. There is naturally some difference between the N.C.B. Housing Association and the I.H.A. The former is being controlled and financed by the Board,¹ but is to have its own organisation, whereas the latter served only such firms in the industry as subscribed to it and was largely financed by the Public Works Loan Board. In spite of these differences, however, the fact remains that the coal-mining industry has been obliged to resume a direct responsibility for housing some of its workers, and the purpose is to recruit labour. Up to this stage there is no impediment to the fulfilment of the industry's traditional function. Indeed, the method now adopted shows remarkable similarity to that chosen in the inter-war period, but it is no longer open to the industry to build in a location which is most favourable to labour recruitment. The last word on choice of site now rests with the local planning authority. Before giving final judgment the planning authority ought to reflect on the reason why the colliery village was always placed close to the pit and to count the cost of placing it further away.

The cost in this connection cannot be precisely measured, but if a decision is made with an awareness of cost being incurred, it is not open to the criticism that it is irresponsible. There are grounds for the fear that since the local planning authority seldom bears the cost of its planning decisions, consideration of cost is in constant danger of being overlooked. This is true of planning everywhere, not only in the coalfields.

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¹It will, however, receive the usual housing subsidy for 60 years.

Agricultural Development in Israel

THE ECONOMIC BACKGROUND.

When mandatory government was instituted in Palestine after the first World War, the country had a predominantly rural economy and this situation changed only very gradually during the early part of the mandatory period. The economy was broadly based upon the Arab peasant farmer on the one hand and on the Jewish settler on the other. Industrial development did not start until the middle 'thirties and was given its first impetus by the development of an electric power grid, by the Haifa oil refineries and the Dead Sea Potash works. Manufacturing industries began to develop with the influx of Central European immigrants, bringing with them the necessary skills and some modicum of capital. Apart from these industrial beginnings, the only non-agricultural industry of importance was the pilgrim and tourist trade. Exports consisted predominantly of citrus fruit. Financial stability was maintained by a currency backed by sterling and financial solvency by the continuous influx of immigrant capital.

The first major change came during the second World War, when manufacturing industries gained increasing importance, by supplying the Allied armies as well as the civilian market in Palestine and other Middle Eastern countries with badly needed goods that could not be imported from Europe owing to the war situation. Under these conditions of protection, manufacturing industries could gain the experience and accumulate the resources needed to establish themselves on a permanent basis. War-time shortages continued almost up to 1948, when, with the establishment of the State of Israel, a radical change occurred in the economic situation.

The first and most important factor in this change was mass immigration. What this meant can best be seen by reference to some population figures. The population has more than doubled between 1948 and 1952. Since then, the rate of immigration has dropped sharply. The majority of the immigrants were entirely without capital resources. In order to provide for their economic integration, the economy had to

TABLE I
POPULATION CHANGES IN ISRAEL, 1948/53

Date	Population Total	Jewish	Other	Percentage gainfully employed, Jewish pop.	Percentage in agriculture among gainfully employed, J.P.
Nov. 1948	786,000	717,000	69,000		
Dec. 1949	1,174,000	1,014,000	160,000	33·4%	13·9%
Dec. 1952	1,629,000	1,448,000	179,000	36·6%	14·7%
Dec. 1953	1,669,000	1,483,000	186,000		

Source : *Statistical Abstract of Israel, 1953/54.*

be greatly expanded and, in the absence of an influx of immigrant capital, the resources of the country were obviously inadequate for this task. Recourse had therefore to be taken to foreign aid on a very large scale.

The second factor was inflation, caused by a combination of financial and economic developments. Israel had to leave the sterling area and lost the benefit of a currency stabilised from the outside. Mass immigration led to an immediate shortage of consumer goods and at the same time led to a high rate of investment. The war of independence severely limited civilian production. Together with other contributory causes, this led to a large measure of inflation. Its extent can be gauged from the fact that the exchange value of the Israel pound has dropped since 1948 from parity with sterling to four shillings to the Israel pound, at official rates. Only during 1954 could inflationary pressures be checked sufficiently to allow prices and wages to be more or less stabilised.

The third factor was that Israel was cut off by the War of Independence from its natural economic hinterland in the Middle East. Whilst by the character of its economy and by its geographic location, Israel is a complementary economic area to the rest of the Middle East, the present political conditions make the development of the natural economic pattern impossible for the time being. In developing its foreign trade relations, Israel has therefore been unable to use its advantages

of location and has had to orientate itself towards other markets and sources of supply. In addition the present unsettled political conditions impose a considerable burden of defence expenditure.

This general summary of the economic background tends to show some of the major causes of a state of affairs wherein the economy of the country is insufficiently developed to maintain its population at a reasonable standard of living without foreign aid. This situation finds its expression in a highly adverse balance of trade, showing a deficit of approximately 200 million dollars during 1953, the equivalent of about 30% of the estimated gross national income during that year.

THE OBJECTIVES OF AGRICULTURAL POLICY.

The objectives of agricultural policy in Israel are the natural sequel to the economic situation just described. To sum up in one sentence, the aim of Israel agriculture is the development of the country's agricultural resources so as to make the optimum contribution towards achieving a balanced economy, independent of foreign aid. A balanced economy is understood to mean a self-supporting one, in terms of foreign exchange, able to provide a reasonable standard of living. No autarchic objective is implied.

This general objective consists of a number of component parts which must be brought into harmony. The primary obligation of policy is to make a contribution towards reducing the balance of trade deficit. A higher level of agricultural output is therefore called for, in order to reduce the need for imports as well as to increase exports of agricultural produce.

Israel's present food imports run at the rate of between 50 and 60 million dollars per year. To that could be added non-food agricultural produce such as raw cotton which is being imported at an approximate rate of 5 million dollars annually. In addition, considerable imports are needed of such requisites as fertilisers, feeding-stuffs, fuel, machinery, etc. in order to sustain home production. Expenditure on such items amounts to another 15 to 20 million dollars per year. Direct and indirect foreign currency requirements for the supply of agricultural produce therefore amount to a sum of 75 to 85 million dollars per year, out of total imports of 280 million

dollars. This is offset by export earnings from agricultural produce (mainly citrus fruit) amounting to between 20 and 30 million dollars. A range of figures is given for both exports and imports in order to underline the fact that world market price changes within one year may well account for a considerable swing in either direction. The 1953/4 season for citrus exports yielded gross earnings of 30 million dollars, compared with 20 million dollars in the previous year, owing to a combination of good prices and a good crop.

In order to achieve any considerable increase in agricultural production, the agricultural labour force must be greatly increased. The figures quoted in Table I with regard to the percentage of gainfully employed in the population is in itself not very high. But apart from a certain measure of recorded unemployment which is implicit in the figures, they tend to mask the extent of a much larger hidden unemployment. This is due to the fact that many earners are in fact engaged on unemployment relief work and that these earners can obtain only partial employment in this way, often amounting to not more than 15 days' work per month. There is thus a considerable potential labour force available and the provision of productive permanent employment in agriculture would in itself contribute considerably to solving the problem of the economic integration of immigrants. The labour requirements for an expanded agriculture are considerable and the present number of earners in agriculture is too low at 78,000 to sustain the required increase in production. This estimate in itself would tend to be high, since it includes partial earners such as farmers' wives. Land settlement on a large scale is therefore an integral part of agricultural policy. Moreover, it is maintained by a large section of opinion in Israel that for reasons of social policy a proper balance between rural and urban populations should be aimed at and that the rural element is too small at present. The advantages of this are of course not easily demonstrated from the economic point of view, but nevertheless experience in many parts of the world, including Israel, seems to show that a community derives considerable social benefits from a well-founded, stable rural element.

Land settlement then must be counted as the second important element in Israel agricultural policy.

The final corollary of agricultural policy is the proper development, utilisation and preservation of the country's physical agricultural resources. These are unfortunately not very ample. About half the country's land area is permanent desert in the sense that climatic and soil conditions do not allow of any agricultural utilisation in the present state of our technical knowledge. Whilst experiments in desert reclamation are being actively pursued in Israel, their economic feasibility is at present not sufficiently well established to allow of their inclusion in a plan intended for immediate implementation.

A national land use capability survey which was begun in 1950 and completed in 1954 provides data to illustrate this problem.

TABLE II
LAND USE POTENTIAL IN ISRAEL

	Under dry farming and without major land reclamation	After irrigation development and land reclamation
Cultivable area	4,093 sq. km.	5,723 sq. km.
Pasture	3,318 " "	1,953 " "
Afforestation	882 " "	882 " "
Fish Ponds	34 " "	34 " "
Rivers, wadis, lakes, reservoirs...	227 " "	227 " "
Built-up area	448 " "	448 " "
Ruins, mounds, anitquities ...	27 " "	27 " "
Coastal Sand Dunes	—	265 " "
Badlands and Negev Sand Dunes	205 " "	205 " "
Desert (not mapped)	11,201 " "	11,201 " "
Total area of Israel	20,700 " "	20,700 " "

Source : *Soils of Israel and their land use capabilities*, by N. Gil and Z. Rosensaft, Ministry of Agriculture Publication, No. 54, 1955.

The processes of soil erosion have advanced far. Considerable areas have deteriorated beyond hope of recovery. Large additional areas are marginal in the sense that extensive and costly measures of reclamation are needed to bring them into use. On much of the remaining land, some measure of soil conservation is essential to prevent future deterioration.

In a semi-arid country like Israel, water is as important an agricultural resource as soil. In view of the climate, intensive systems of farming can only be established on irrigated land, where an annual output at least four to five times as high can be obtained per unit as on unirrigated land. Irrigation and water-resources are thus a crucial factor in agricultural expansion. The sustained yield of known water-resources is estimated at a total of 2,400 million cu.m., sufficient to irrigate an area of about 300,000 ha.

TABLE III
ISRAEL WATER RESOURCES

					M. Cubic Metres p.a.
1. Rivers :	Upper Jordan	...	...	...	670
	Yarkon	...	...	...	209
					<hr/>
2. Springs	...	...	...	...	879
3. Ground water including return flow from irrigation	...	...	...	...	226
4. Storm flow in wadis	...	...	...	...	1,097
5. Reclaimed sewage effluent from major towns	...	...	...	...	174
					<hr/>
	Grand Total (excluding Yarmuk)	...	...	...	2,466
					<hr/>

Source : *Data and Plans*, Publ. Ministry of Finance, Jerusalem, Oct., 1953.

The development of irrigation water and the reclamation and conservation of the soil are thus the third element of agricultural policy. The general objective of policy must be expressed in terms of a comprehensive plan, containing detailed programmes for production, settlement and resource development.

THE AGRICULTURAL DEVELOPMENT PLAN.

With these purposes in mind, the Israel government, together with the Jewish Agency for Palestine has formulated an agricultural development plan which was published in 1953.

This plan is a first attempt to present a comprehensive policy in terms of the objectives discussed above. Whilst the plan is not rigidly tied to a specific period of implementation, it is hoped that the targets set can be reached by 1960.

The plan assumes that by that time the population will have grown from 1.6 million to 2 million inhabitants, as a result of a natural increase of 30,000 per year and of a net immigration at the rate of about 30,000 per year. Whether immigration will in fact reach this rate is not easy to forecast.

It is not envisaged that the total cultivated area will increase considerably. Only a modest enlargement from 358,000 to 365,000 ha is aimed at. But the irrigated area is to be trebled, from 60,000 to 180,000 ha, as a result of an increase in available irrigation water from 550 to 1,300 million cub.m. per annum. It is intended to make more rational use of irrigation water and thus to lower the average water duty from 900 to 700 mm. The per capita area of irrigated land will increase from 0.036 to 0.092 ha. It has been theoretically computed that sufficient food for one person could be produced under Israel conditions on an area of 0.1 ha of irrigated land. A much greater measure of self-sufficiency for food could therefore be expected from the implementation of the plan.

The plan envisages a change in emphasis in the structure of Israel agriculture. In the past, the main branches of production have been dairying, poultry, vegetables and fruit. Whilst some further growth is needed in these well-established branches, the main effort of expansion will be in field crops. Sugar beet, groundnuts and cotton figure prominently in the plan. Grain production is also to be expanded considerably, in particular by growing maize and perhaps even wheat under irrigation. Citrus groves too are to be considerably expanded.

The main reason advanced for this change in emphasis is the need to produce at home part of the requirements at least of certain essential commodities that are now being imported. In addition, it is held that given a limited agricultural potential, Israel should not allow its production of animal products to expand excessively and should instead seek expansion in the direction of foods for direct human consumption. It might be

argued, that rather than producing at home commodities like sugar, cotton and oil seeds which are plentiful on world markets, Israel should try to increase her exports of those commodities in the production of which she has considerable natural advantages and to continue importing others.

To some extent this is indeed the case and wheat in particular will continue to be largely imported. Of the 250,000 tons required annually, probably not more than one-third will be home-produced. For groundnuts and cotton, all indications are that Israel is indeed naturally well-suited to their production. Yields obtained are higher than in the United States. Groundnuts have indeed been found to be of a high quality, capable of being exported at premium prices. Production costs are still high but may be expected to drop as experience is accumulated.

At the same time, it is intended to expand the production of export crops, not only of citrus but of bananas, wine, out-of-season fruit and vegetables, etc. There are, however, limits to export possibilities, first of all owing to the increasing competition in international markets. In addition too much dependence on the fluctuations of international trade in agricultural produce would introduce a considerable element of risk which is entirely beyond the control of a small country like Israel. It is thought to be preferable to establish agricultural production primarily on the firm basis of the home market where fluctuations can at least to some extent be mitigated by governmental action.

The figures in Table IV will give an idea of the Israel Food Balance Sheet at the end of the plan period.

In order to carry out a production programme of this order, considerable labour and capital resources are required. It has been estimated that an additional 41,000 families will have to be settled on the land, bringing the total from 42,000 in 1953 up to 83,000 at the end of the period. The investment required in order to finance the programme is shown in Table V.

TABLE IV
FOOD BALANCE AT END OF DEVELOPMENT PERIOD

	Kg. per person	Consumption			Production	Imports
		Internal	Exports	Total		
a. Human Food—		tons	tons	tons	tons	tons
Vegetables ...	120					
Potatoes and Sweet potatoes } ...	60	360,000	40,000	400,000	400,000	
Sugar (1,000 litres) ...	24	48,000	9,000	57,000	57,000	
Milk (litres) ...	123	286,000		286,000	286,000	
Oil ...	14	28,000	2,000	30,000	30,000	
Eggs (units) ...	200	m. 400		m. 400	m. 400	
Meat ...	9	18,000		18,000	18,000	
Fish ...	15	30,000		30,000	30,000	
Wheat { for bread ...	120	240,000		240,000		
Maize { groats, se-molina, etc. ...	30	60,000		60,000	125,500	174,500
Legumes ...	10	20,000		20,000	20,000	
Groundnuts, peanut butter, sweets, etc. ...	5	10,000		10,000	10,000	
Citrus fruits and products (in 1,000 boxes) ...			11,300	11,300	11,300	
Culls ...	45	90,000		90,000	90,000	
Table Grapes ...	20	40,000		40,000	40,000	
Wine and Raisins (litres) ...	4	8,000	10,000	18,000	18,000	
Sub-tropical fruits, bananas, windfalls ...	28.5	57,000	20,000	77,000	77,000	
Melons, marrows, etc. ...	14.5	29,000		29,000	29,000	
Tobacco ...		2,000	1,000	3,000	3,000	
Honey ...		500	500	1,000	1,000	
b. Livestock Feed—						
Grains, carobs, chaff, oilcakes ...		204,000		204,000	204,000	
Pulp ...		64,000		64,000	30,000	34,000
Legumes ...		6,000		6,000	6,000	
Coarse feed and* industrial waste ...					287	
Natural pasture* ...					80	
c. Fibres—						
Flax-straw ...	1.5	3,000		3,000	3,000	
Cotton ...	2.8	5,600		5,600	5,600	

NOTE : The amount of seed needed for sowing has been deducted from the crop.
 * In million units.

Source : *Data and Plans*, Ministry of Finance, Jerusalem.

TABLE V
INVESTMENT REQUIRED FOR THE AGRICULTURAL
DEVELOPMENT PLAN

	In Thousands of £1	In Thousands of \$
a. Structures and Equipment ...	137,500	56,300
b. Irrigation	148,200	102,000
c. Processing	8,600	10,900
Grand Total	294,300	169,200

Source : *Data and Plans*, Ministry of Finance, Jerusalem, 1953.

For each item in the investment budget, the sums required for the import of capital goods are shown in dollars and those that can be financed locally are shown in Israel pounds. It will be seen that approximately half the sums required are in foreign currency. Of the totals, more than half is required to carry out the necessary irrigation works.

The results of the plan in terms of increased agricultural production are shown in Table VI and the effect on the balance of payments is shown in Table VII.

TABLE VI
VALUE OF AGRICULTURAL OUTPUT AT 1952/53 PRICES

	1952/3	1959/60
	Million	dollars
Produce for home market	62.0	148.6
Feeding-stuffs	15.0	25.9
Citrus exports	19.0	39.5
Other agricultural exports	—	11.2
Total value of gross output	96.0	225.2

TABLE VII
BALANCE OF PAYMENTS EFFECT OF AGRICULTURAL
DEVELOPMENT PLAN

	1952/53	1959/60
	\$ million	\$ million
<i>a. Foreign currency expenditure</i>		
Current expenditure on agricultural production, including processing, and interest and depreciation	34.0	53.0
Import of food from abroad	65.0	16.8
Total	99.0	69.8
<i>b. Foreign currency income</i>		
Agricultural exports	19.0	50.7
<i>c. Deficit...</i>	80.0	19.1

Source : *Data and Plans*, Ministry of Finance, Jerusalem, 1953.

As can be seen from these figures, a considerable reduction in food imports is hoped for, as well as an increase in agricultural exports. The net improvement in the balance of payments will however be reduced by the increased requirements for imported fertilisers, feeding-stuffs, fuel, machinery, etc. needed for the larger production programme.

LIMITATIONS OF THE PLAN

Not many countries can have had opportunities similar to those presented in Israel for planning their agricultural industry. Usually, agricultural planning means changing an existing agricultural situation and putting a new one in its place. In Israel, after the War of Independence, to a large extent there was no existing agricultural situation but only the components out of which the industry would have to be built. Apart from the old-established Jewish settlers who occupied about 60,000 ha and of those Arab cultivators who had not fled and who occupied another 40,000 ha, the land was uncultivated. Most of the country's water-resources were as yet unused.

There were streaming into the country masses of new immigrants, some of whom could be settled on the land and turned into farmers. Finally, there was available a considerable body of agricultural knowledge, derived from the experience gained in land settlement during the last fifty years. At first sight it seemed that under these circumstances, planning would be less fettered by limitations than is the case, wherever the inertia of established tradition is a considerable obstacle to progress. In fact, however, the objectives aimed at and the resources available have imposed severe limitations and there was little latitude for arriving at a practicable solution.

The principal limitations are lack of capital, a scarcity of effective labour supply, restrictions on the types of farms which can be established and last but not least, marketing problems.

The first factor limiting development at present is the availability of capital. This refers particularly to the availability of foreign exchange for the import of needed capital goods, but also and almost as stringently to local capital. Over half the capital required would have to be put into irrigation works, which are long-term low-return investments almost everywhere in the world. In Israel, the initial outlay is even higher than in most other places. For geographical and geological reasons, most of those schemes that are feasible from an engineering point of view are also very expensive, because water has to be transported over considerable horizontal and vertical distances through pipes. In order to obtain a favourable cost-benefit ratio from such schemes, intensive types of farming must be established on the irrigated land, which require a rather high complementary investment in live and dead stock. The question immediately arises how the returns on capital invested in agriculture compare with those in other branches of the economy. For a variety of reasons it is difficult to obtain data for profits in agriculture and it is therefore almost impossible to make a meaningful comparison. On the typical holding in Israel, whether it be a large collective farm, a small-holding or an Arab peasant holding, it is impossible to estimate separately remuneration for farmer's and family labour and profit on capital invested. Since the overwhelming majority

of earners in agriculture are self-employed, the wages bill of the industry gives no good indications for an imputed income to farmers' work. Loan capital for agricultural investment is preponderantly supplied by public and semi-public financial institutions, at special rates, which are non-competitive, and do not therefore yield representative information on what competitive interest rates would be. There are a number of additional complicating factors, one of which is the fact that most land is either owner-occupied or held on lease from public or semi-public bodies, for which purely nominal rents are charged. It is therefore not even possible to distinguish returns on land value from returns on capital investment.

From the point of view of financing an agricultural development plan, however, it may not be decisive to make the comparison of profitability with other industries. Essentially, the investment required will have to be financed out of public funds, since private risk-capital is insufficiently attracted by long-term low-interest projects such as irrigation schemes. This, however is an appropriate field of activity for government, because of its low-risk element and can be regarded as analogous to public-utility investment. On the other hand, certain fields of complementary investment in agriculture seem to be sufficiently profitable to attract private capital, as evidenced by the fact that considerable sums are being invested in citrus groves. Moreover, there has been for some years a considerable volume of reinvestment of farmers' profits. Whenever settlement is initially financed by loans, the initial equipment provided in this way is insufficient for the full development of the holding, and further investment is financed out of reinvestment of profits. However, since the volume of such operating profits is insufficient to sustain the rate and speed of development desired, this reinvestment must again be supplemented by additional capital from outside the industry.

A second question is the optimum level of investment per unit area and per worker. Under Israel conditions, where an extensive, unirrigated system of agriculture is being transformed into an intensive, irrigated one, the optimum level of capital inputs (*i.e.* the level at which marginal input equals

marginal output), may lie considerably above what is usual in the agricultural industry in other parts of the world.

As has been shown, the availability of capital imposes severe limitations on the rate of agricultural development, the more so since a high level of investment is needed for optimal returns. Furthermore, a second limitation can make itself felt in the form of the inflationary effect of long-term investment in agriculture, especially when financed by foreign aid rather than by savings. This limitation applies in some degree to all investment but perhaps more in agriculture than elsewhere.

Most under-developed areas in the world are predominantly rural and one of the conditions of their economic progress is that part of the surplus labour force should be drained out of the reservoir which consists of under-employed agricultural earners. A similar labour pool exists in Israel, as has already been shown, in the form of unemployed or under-employed new immigrants. But in this case, part of this labour force could find its way *into* agriculture, owing to the availability of unused agricultural resources. The potential labour force however is almost completely devoid of agricultural knowledge and experience. This in itself poses a formidable task of vocational re-training. But in addition, few of the new immigrants have a natural inclination for rural life. Jews in most parts of the world are town-dwellers and their natural inclination when coming to Israel is to congregate in the towns. Compulsory direction of labour is not an acceptable practice in Israel and this means that in order to attract immigrants to land settlement, some inducement must be given in terms of a standard of living and amenities comparable to those of the urban population. To some extent, the existence of a certain measure of urban unemployment has been found to stop movement out of agriculture and even to increase slightly the rate of movement into it.

The potential agricultural labour force available to implement development is unskilled, both manually and managerially, and their output when employed in agriculture will at least initially be low. If, in order to attract this labour force to agriculture at all, comparatively high

earnings must be offered, for a low output the result will be that labour, despite its potential availability in abundance, becomes an expensive and therefore a scarce factor of production.

At the same time it should be mentioned that the skills possessed by many of the new immigrants make them hardly better fitted for employment outside agriculture, and their output in secondary or tertiary occupations would not in itself be much higher than in agriculture. But for those occupations, no special incentive is needed to attract labour.

The question is often raised, what would be the optimum number of people that should find their livelihood in agriculture. In view of the above considerations, this number can clearly not be set at a maximum attainable by using large amounts of labour in agriculture to substitute capital. Nor can any significance be attached to a given percentage of the total number of gainfully employed. The total numbers should not exceed those needed in order to utilise land and water-resources as they become available. In practice numbers will be limited among other factors by the ratio of earnings in agriculture to those in non-agricultural occupations. This in turn will largely depend upon the price the consumer is able and willing to pay for agricultural produce.

When discussing numbers of earners in agriculture, a sharp distinction must be drawn between independent farmers and wage-labourers. Clearly, the task of training in the manual skills required for agriculture, formidable though it is, is much more rapidly accomplished than training potential farmers in the technical and managerial skills needed to turn them into efficient independent producers. In other words, the productivity of manual labour can be raised quicker than that of managerial labour and the latter is therefore more costly and scarcer. In determining the numbers that can be drafted into agriculture, a separate estimate must therefore be made for farmers and farm workers. For some years to come it will be cheaper to absorb manual labour into agriculture than to establish new individual family farm holdings.

Closely connected with this issue is the one relating to the type of farm that should be provided for the new settlers.

In the recent past, a preponderant proportion of new settlements have been of the co-operative smallholdings type, providing a family farm unit of 7.5 acres under full irrigation. This would be roughly equivalent to a 30 to 40 acre smallholding in England, from the point of view of labour requirements and value of output. Communal settlements have not been established in large numbers during the last three years. Although in theory they would be a very good way of drafting manual labour into agriculture without burdening the beginners with all the managerial cares, in practice most new immigrants of the last few years have proved unwilling to adopt this way of life. The policy of establishing smallholdings which resulted from the lack of candidates for communal settlements, has recently been criticised on several grounds. First of all, as has already been pointed out, many new immigrants do not possess the ability or even the willingness to run their own farms. Secondly, smallholdings are more expensive in terms of investment per acre than larger units. Thirdly, land parcellation into small plots is almost incompatible with effective soil conservation. Fourthly, the parcellation at this stage of development creates too rigid an agrarian pattern at a time when the pattern of agricultural production is still very much in flux. To meet these criticisms a beginning has been made with an intermediate form of settlement in large estates run by the Colonisation Department together with farmers' organisations, where the new settlers will be employed as hired labourers for some years, with the possibility of the estate being split into individual holdings if and when the settlers prove their willingness and ability to run them efficiently. Side by side with this new method, direct settlement in individual holdings continues. A change is however being introduced in that a new type of holding is being developed with a larger land area of ten to twelve acres rather than 7.5 and with a different cropping system.

In drawing up the development plan, due attention had to be given both to food requirements from a nutritional point of view and to consumer demand for food. The former consideration loses much of its importance once a minimum needs

diet is exceeded and the decisive point becomes, what food-basket the consumer can afford. From a health point of view it is considered essential that the national average diet should not be below the present level of 2,600 calories daily, including 82 grams of proteins. Consumer demand has not so far been estimated accurately, but there are some *a priori* reasons which point to its limitations—although during the development period, national output will undoubtedly rise, it is assumed that foreign aid will gradually diminish. In addition, population will continue to increase and it is therefore assumed that disposable per capita income will not rise materially during the period under consideration. To a considerable extent, home-produced food supplies will substitute imported food, but these supplies may well be more expensive to the consumer than imported supplies, as a result of the lower initial efficiency of Israel agriculture for some of the products. Under these circumstances there will be a tendency for the proportion of consumer expenditure spent on food to rise. If this rise will indeed take place, its effect will be a lowering of the standard of living. Alternatively, agricultural income would decrease, which in turn would limit the possibilities to attract capital and labour to agriculture and therefore the possibility to expand production. Whether consumer demand for food and agricultural income can be balanced at the level of output envisaged by the plan must remain to some extent an open question. But in any case, the demand for the more expensive types of food would be highly elastic. At present prices, the effective demand for these foods which in Israel include milk, meat and eggs would be strictly limited. This has its repercussion on the direction which expansion of production must take, and unless the more expensive foods can in fact be produced far more cheaply than they are to-day, the possibilities of expansion are very limited. A larger emphasis must therefore be placed on crop rather than on livestock production.

The home market for food is only one of the alternative market outlets for agricultural produce and in theory expansion could be achieved in other directions, such as exports. Here too, however, several limiting factors make themselves felt. Those products which Israel can produce at a comparative

advantage, *e.g.* citrus fruit, wine, fresh out-of-season vegetables, out-of-season flowers, etc. are either luxury products with a highly elastic demand, or products with increasing international marketing competition, or both. These factors automatically limit the volume of exports attainable at profitable prices. In addition, it is sometimes impossible to export more than a certain proportion of the product. Even under the best management, not more than 70 per cent. of the citrus crop is of exportable quality. Market outlets must therefore be found for the remainder, if exports are to be sustained. In the case of citrus, this problem has been largely solved by the development of a processing industry with a variety of outlets for its products. But in the case of cut flowers for instance, only 15 to 20 per cent. of the crop are of exportable quality and the possibilities of expanding production are limited, not only by the export market but also by the home market.

The direction which agricultural development can take is then limited as much by marketing considerations as by production factors. But on the other hand, the important stimulating effect of agricultural development on the economy as a whole should not be forgotten. By providing raw materials for a variety of processing industries and by providing markets for agricultural requisites, the development of agriculture can have an important multiplier effect on the development of secondary industry. This is well demonstrated in Israel by the rapid development of food industries, ranging from fruit and vegetable canning to the manufacture of wine and olive oil as well as of the chemical industry, ranging from phosphatic fertilisers to the manufacture of DDT.

In formulating the agricultural development plan, an explicit emphasis has been put on the relationship between agricultural output, food requirements and the balance of payments. This has perhaps tended to blur the relation between agricultural output and national income. According to the targets envisaged by the plan, the agricultural contribution to national income would increase from a present estimated 10 per cent. to about 20 per cent. Whilst no intrinsic significance can be attached to the proportional share of agricultural output in the national income, the absolute size of this contribution

will have an important effect on the growth of the economy as a whole. In highly industrialised countries, the per capita national income has risen during the last hundred years concurrently with a decline in the proportionate contribution of agriculture. The example of countries like Denmark and New Zealand has however shown that a high per capita national income can be achieved in a predominantly agricultural economy. Provided that levels of efficiency can be reached in Israel comparable with those of Denmark or New Zealand, there is every reason to hope that agricultural development will make an important contribution to rising standards of living.

IMPLEMENTATION.

The crucial test of all planning lies in the implementation of the plan. In the words of Dr. A. G. Black, formerly Chief of the FAO Mission to Israel, "planning is a continuous process." Nobody in Israel is irrevocably committed to one particular set of rigid figures. Plans will be adapted and modified in the light of experience and as some of the limitations discussed above in general terms become capable of quantitative measurement, plans will be adjusted to meet them.

The guiding principle of implementation will be to refrain from compulsion by administrative order. Instead, the first step in carrying out the plan will be to carry along the farming community by persuasion, discussion and compromise.

This approach is being supported by two major economic instruments—prices and credits. By guaranteed prices and subsidies much can be done to call forth the kind and volume of production desired. But even more important are credits, most of which will have to come from official or semi-official sources. By giving or withholding loans for specific purposes an important direct influence can be exercised upon the size and direction of the agricultural effort.

But success will ultimately be assured not least by the spirit in which the agricultural community and the country face the development task. Only once is a nation given an opportunity such as Israel has to-day.

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Israel.

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